FIG. 4

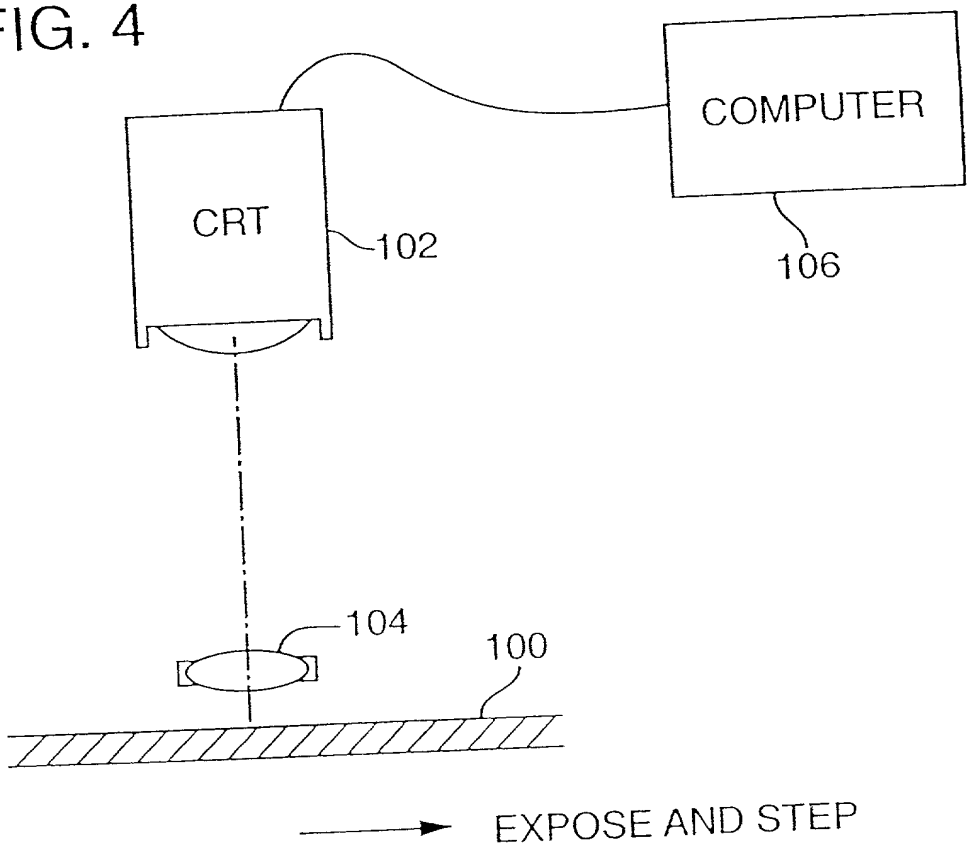

COMPUTER
CRT
102
106
104
100
EXPOSE AND STEP

FIG. 1

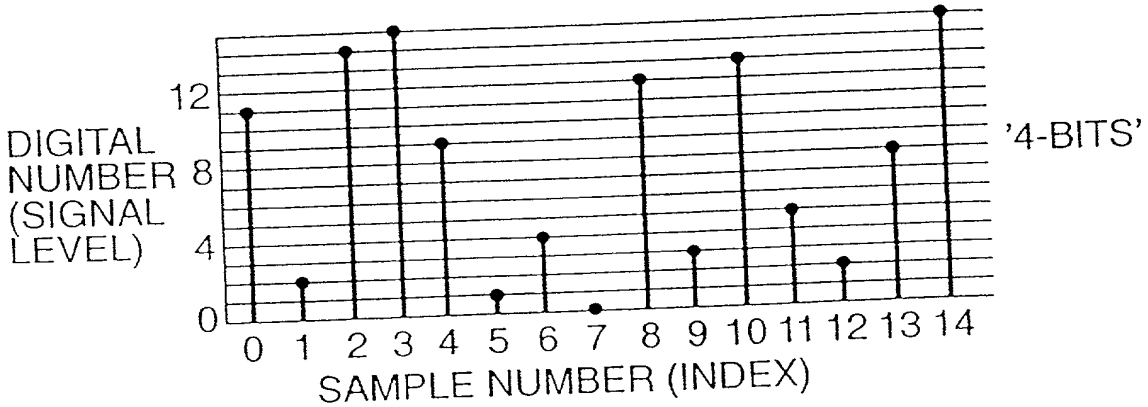
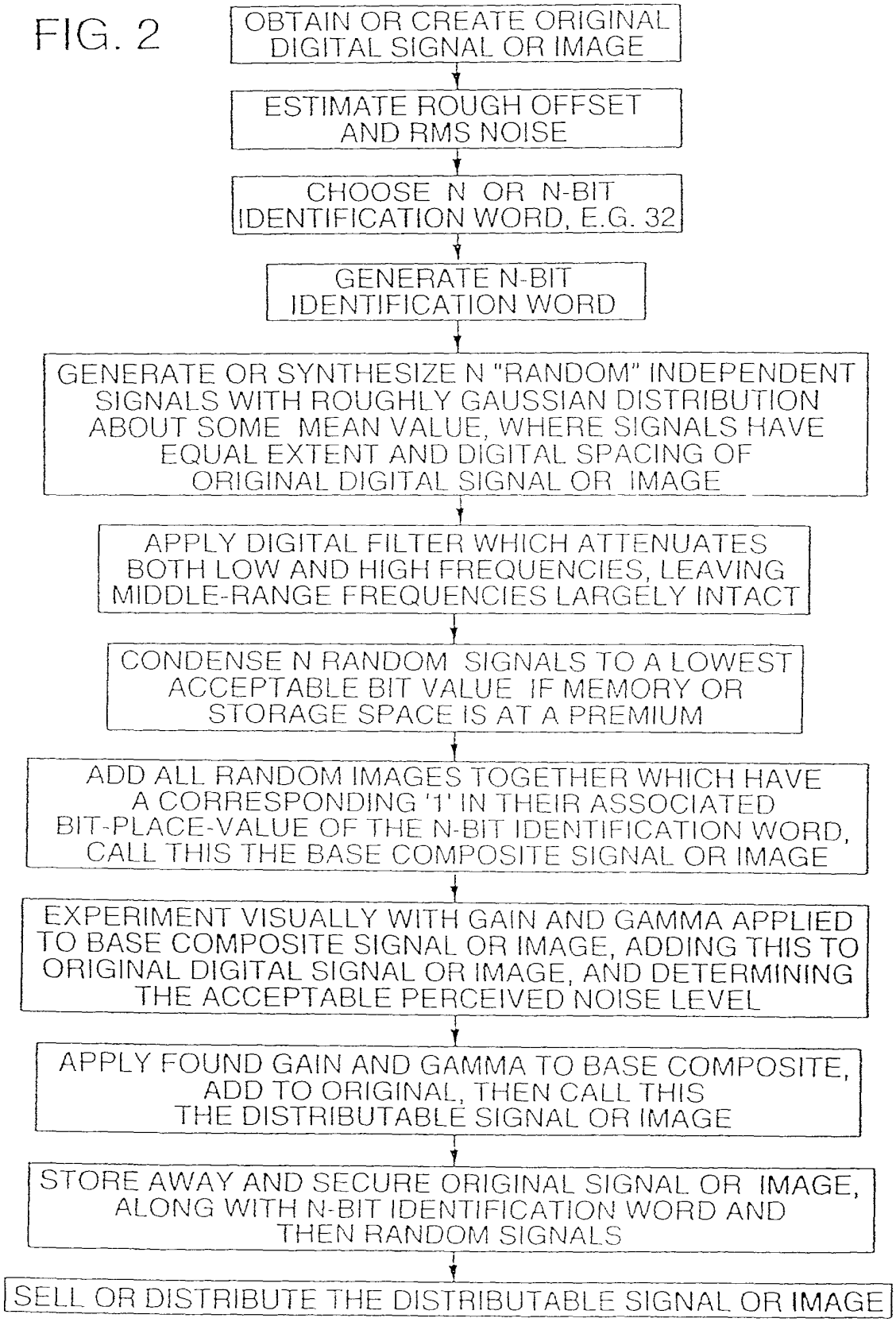
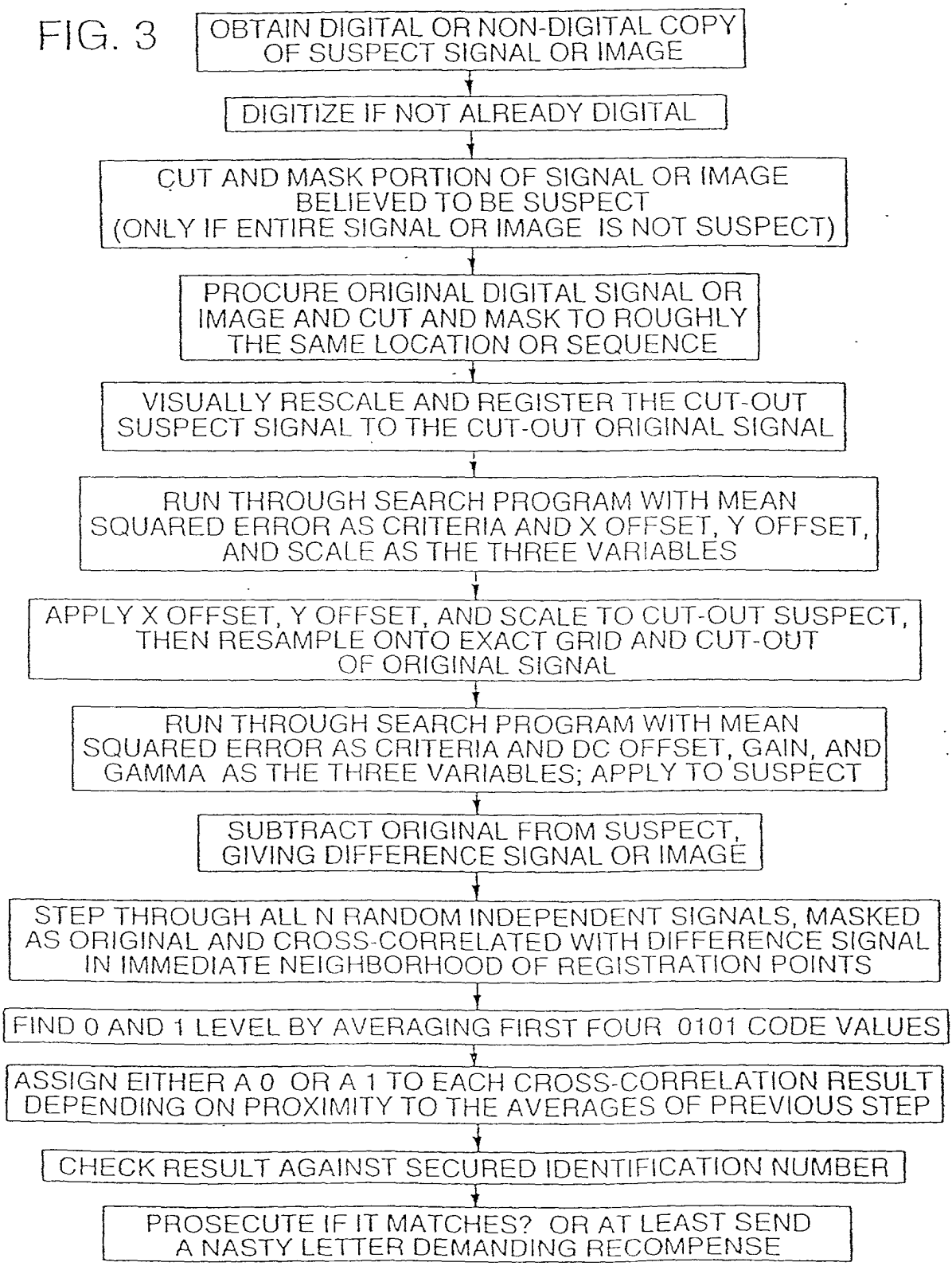

DIGITAL NUMBER (SIGNAL LEVEL)
12
8
4
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
SAMPLE NUMBER (INDEX)
'4-BITS'

FIG. 2



6,636,615

FIG. 3



6,343,138

FIG. 5

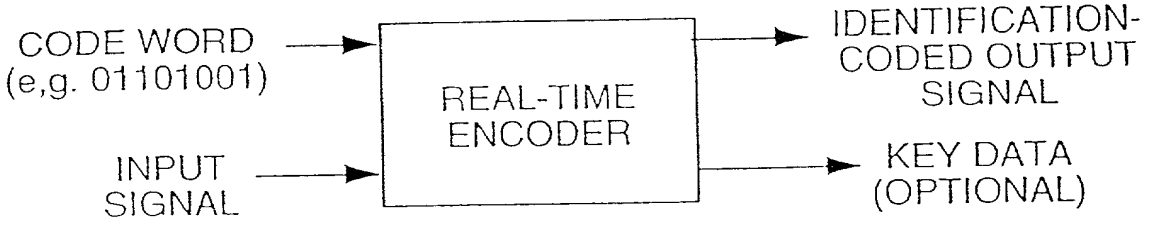
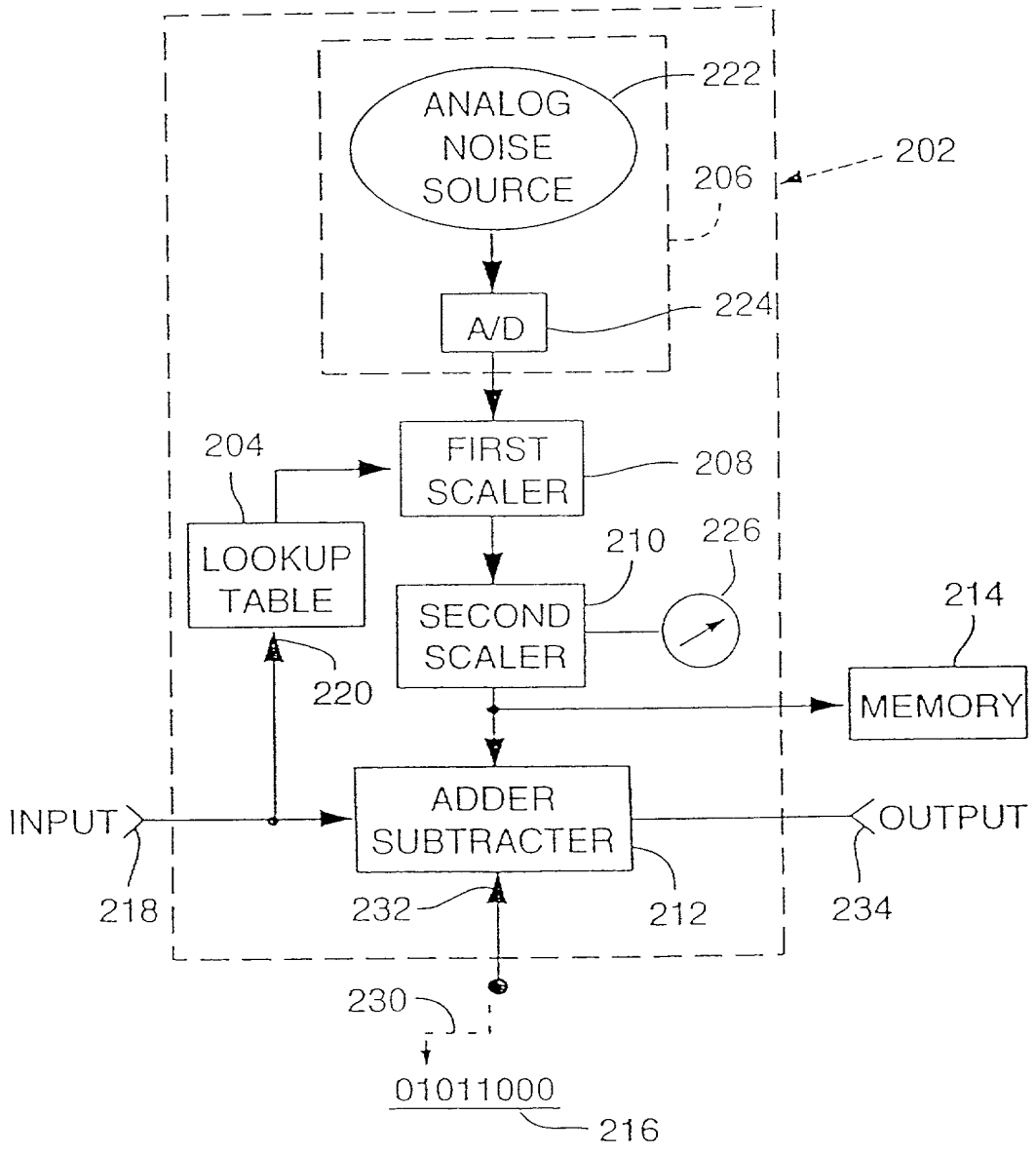

CODE WORD
(e,g. 01101001)
INPUT
SIGNAL
REAL-TIME
ENCODER
IDENTIFICATION-
CODED OUTPUT
SIGNAL
KEY DATA
(OPTIONAL)

FIG. 6


ANALOG
NOISE
SOURCE
222
202
206
A/D
224
204
FIRST
SCALER
208
LOOKUP
TABLE
210
226
SECOND
SCALER
214
MEMORY
220
INPUT
ADDER
SUBTRACTER
OUTPUT
218
232
212
234
230
01011000
216

U.S. Patent Sep. 29, 1998 Sheet 6 of 9 5,815,096

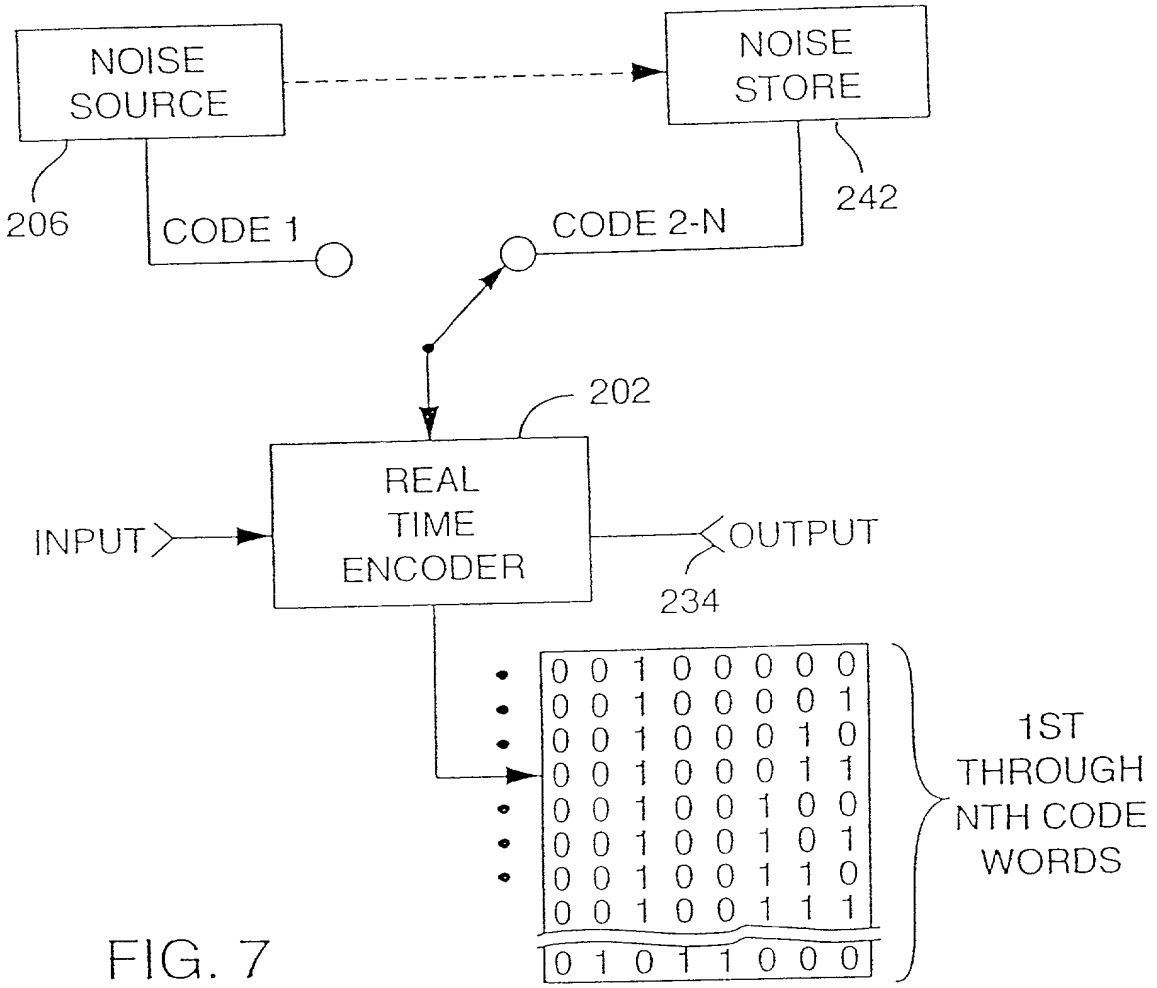


FIG. 7

FIG. 8

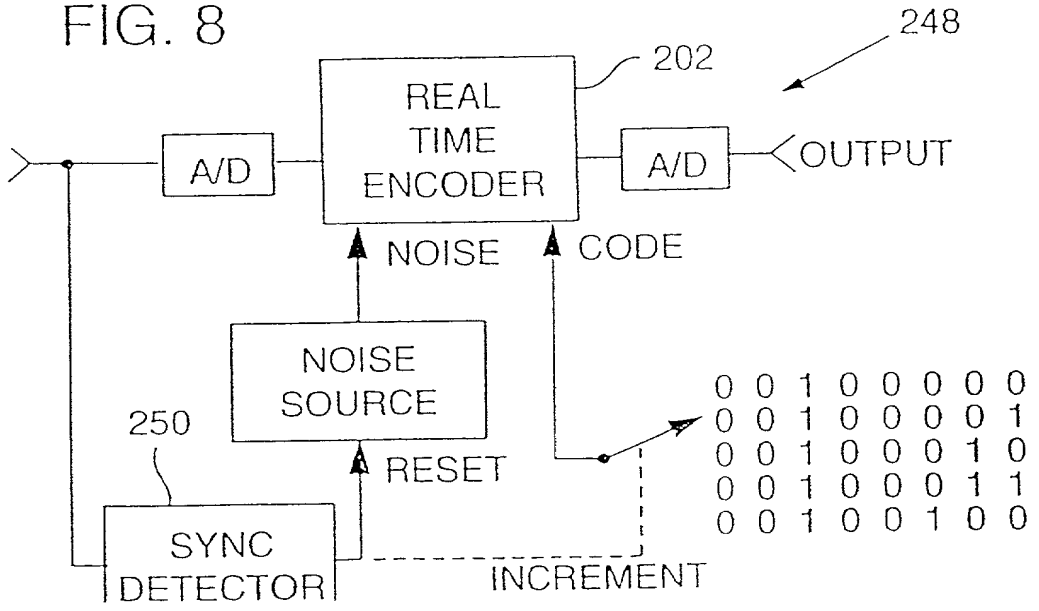


FIG. 9A

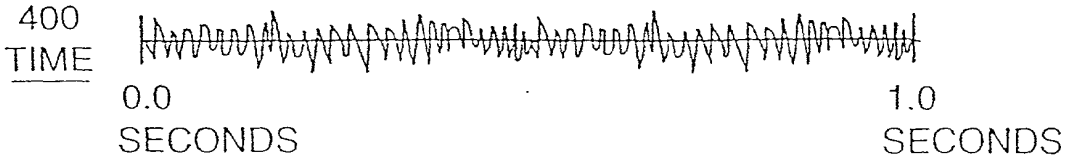


FIG. 9B

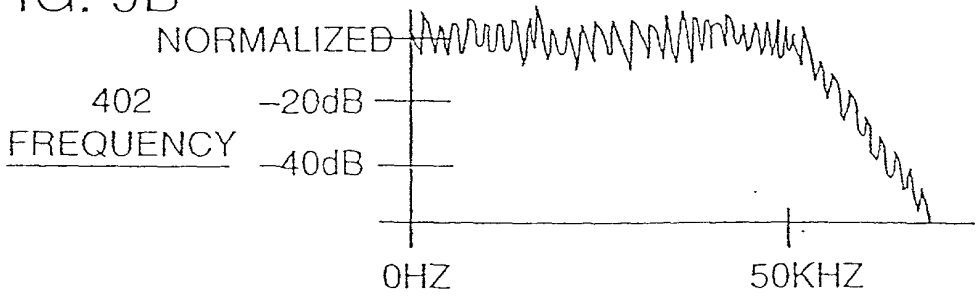


FIG. 9C

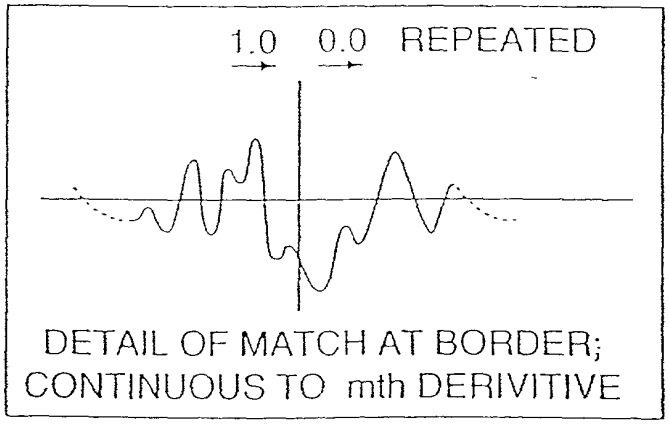


FIG. 10

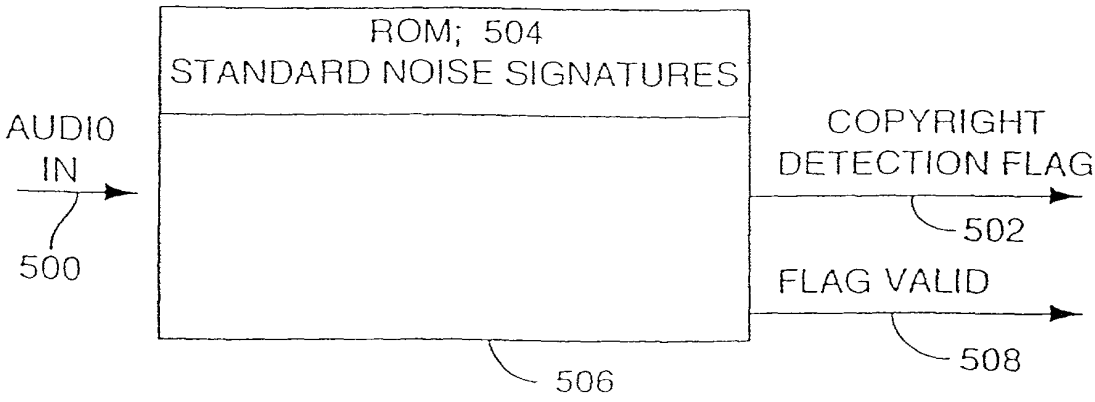


FIG. 11

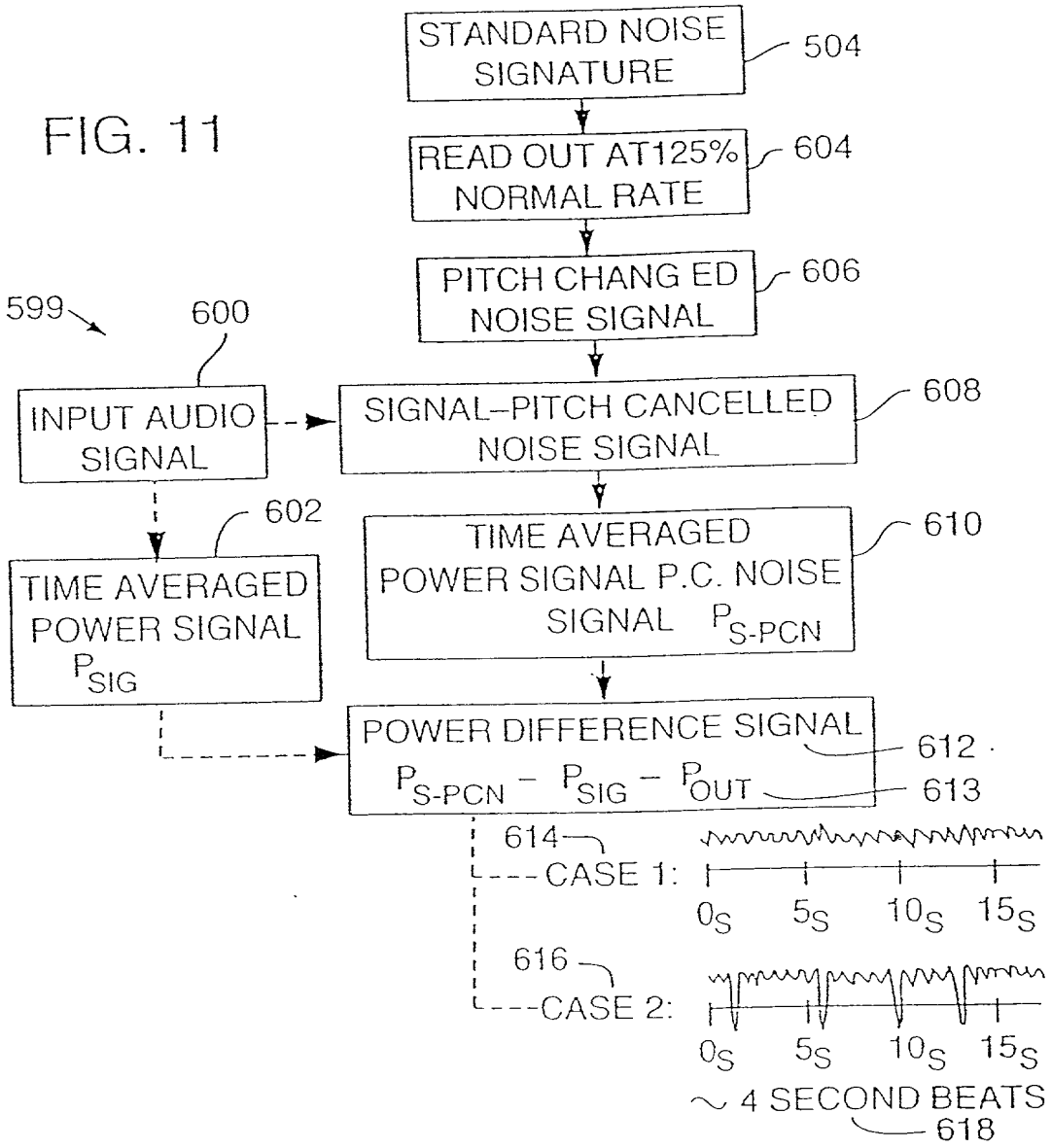

STANDARD NOISE SIGNATURE
504
READ OUT AT125% NORMAL RATE
604
PITCH CHANG ED NOISE SIGNAL
606
599
600
INPUT AUDIO SIGNAL
SIGNAL–PITCH CANCELLED NOISE SIGNAL
608
602
TIME AVERAGED POWER SIGNAL P_{SIG}
TIME AVERAGED POWER SIGNAL P.C. NOISE SIGNAL P_{S-PCN}
610
POWER DIFFERENCE SIGNAL
$P_{S-PCN} - P_{SIG} - P_{OUT}$
612
613
614
CASE 1:
0_S 5_S 10_S 15_S
616
CASE 2:
0_S 5_S 10_S 15_S
4 SECOND BEATS
618

FIG. 12

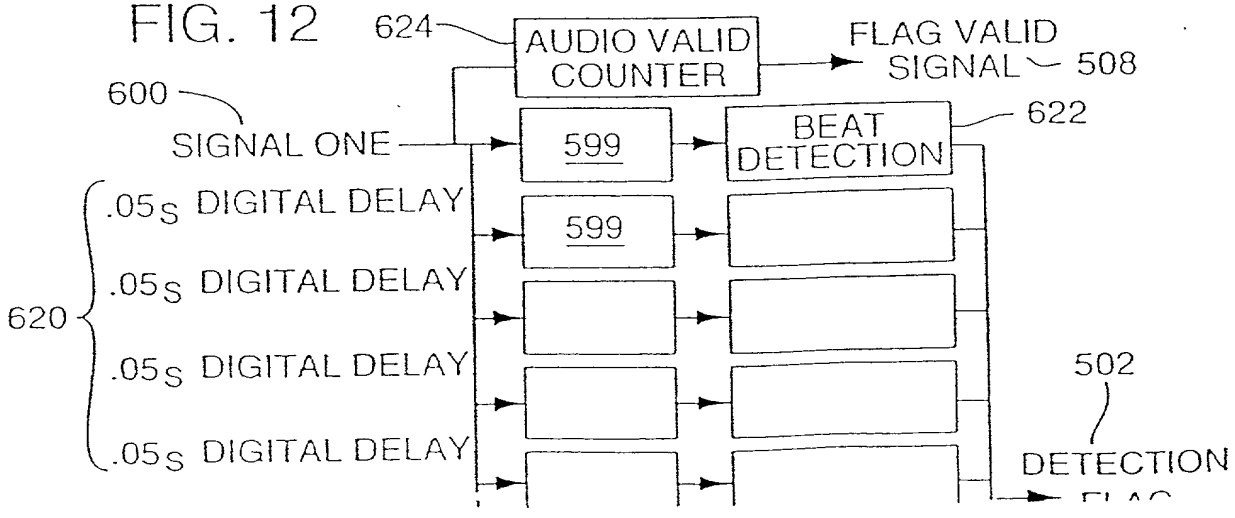
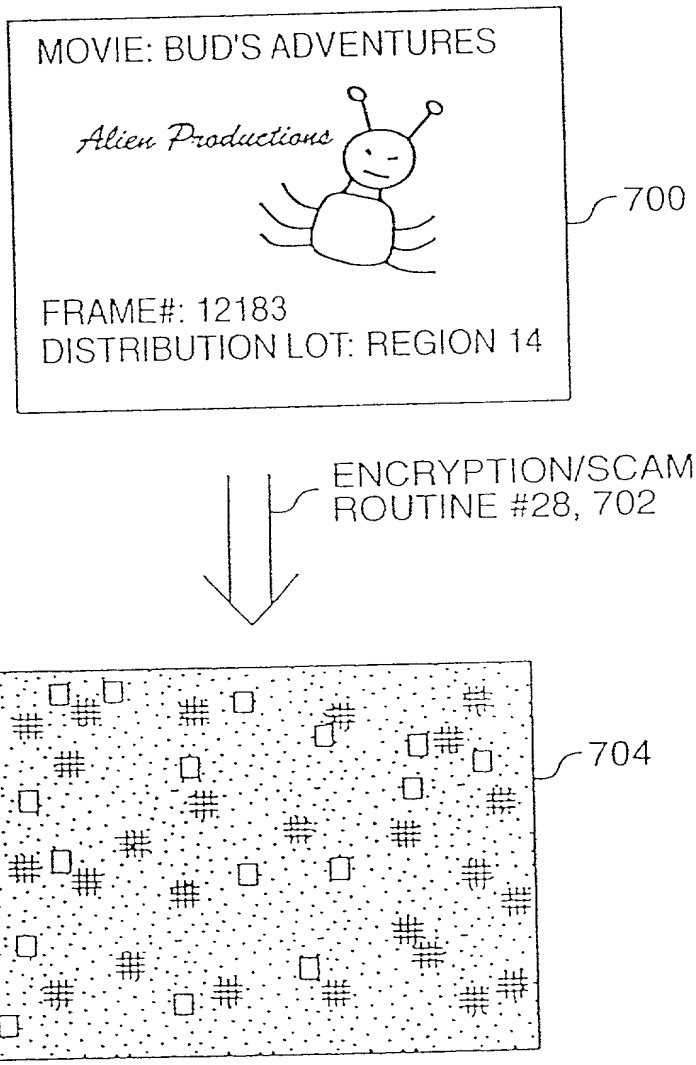
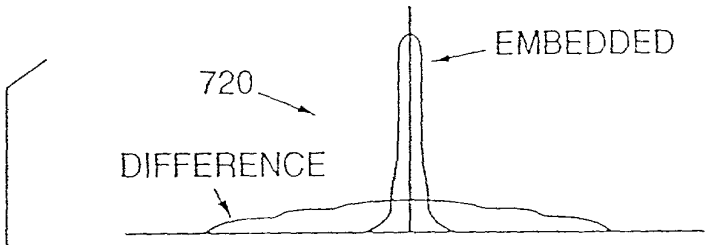

624
AUDIO VALID COUNTER
FLAG VALID SIGNAL
508
600
SIGNAL ONE
599
BEAT DETECTION
622
599
620
.05S DIGITAL DELAY
.05S DIGITAL DELAY
.05S DIGITAL DELAY
.05S DIGITAL DELAY
502
DETECTION

FIG. 13

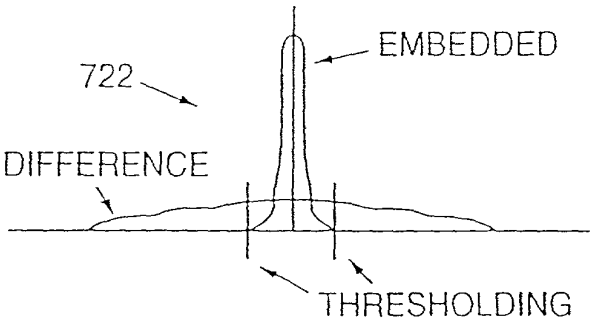


PSEUDO-RANDOM MASTER SNOWY IMAGE
(SCALED DOWN AND ADDED TO FRAME 12183)

FIG. 14



MEAN-REMOVED HISTOGRAMS OF DIFFERENCE SIGNAL AND KNOWN EMBEDDED CODE SIGNAL



MEAN-REMOVED HISTOGRAMS OF FIRST DERIVATIVES (OR SCALER GRADIENTS IN CASE OF AN IMAGE)

Document ID: US 6,252,975 B1

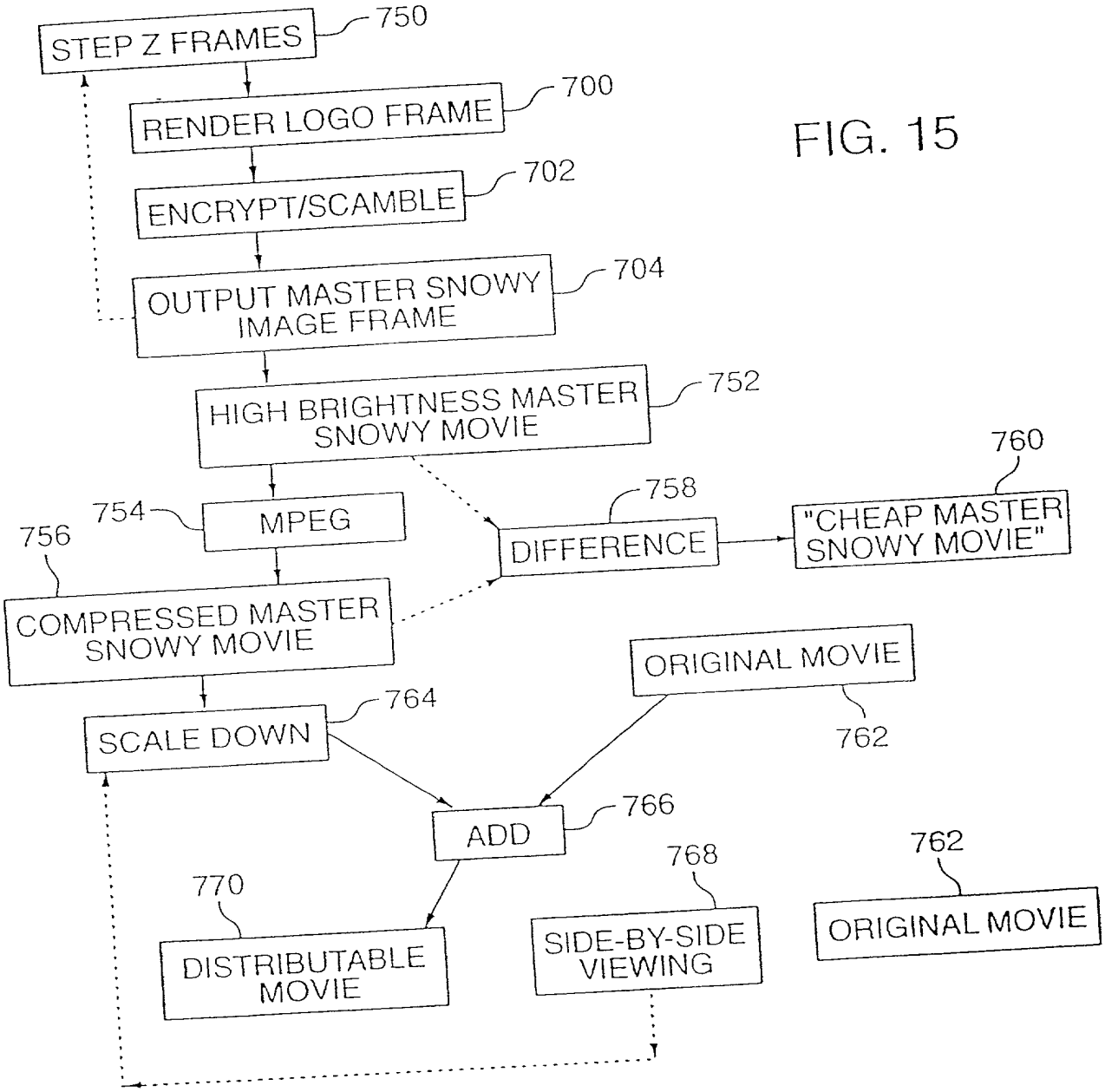
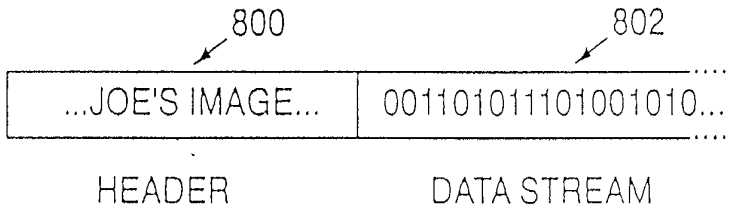
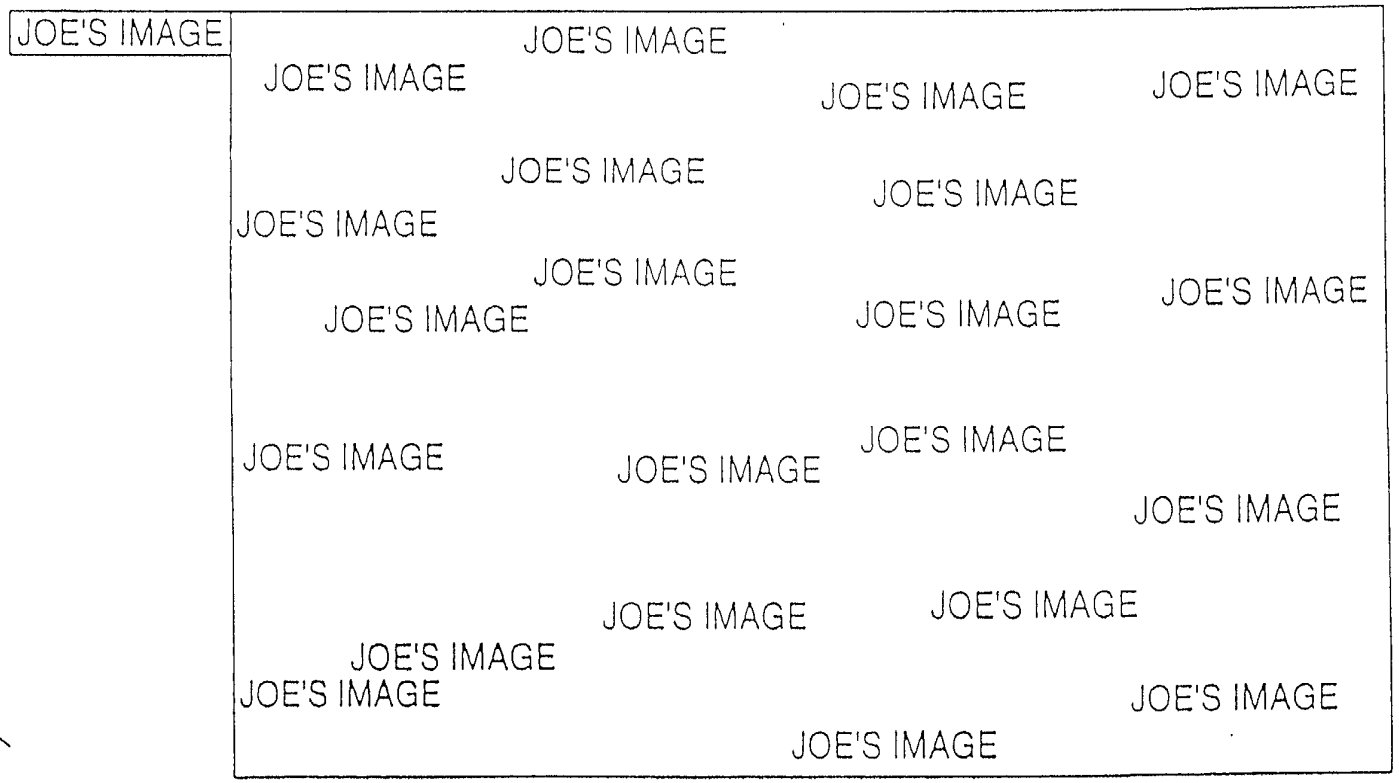


FIG. 15

FIG. 16


800
802
...JOE'S IMAGE...
001101011101001010...
HEADER
DATA STREAM


JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
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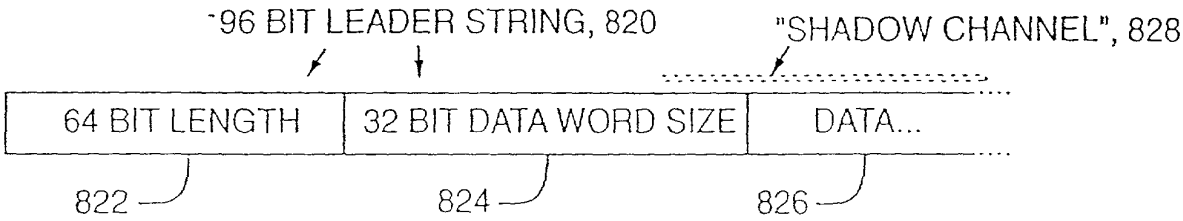
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE

FIG. 17



UNIVERSAL EMPIRICAL DATA FORMAT

FIG. 18

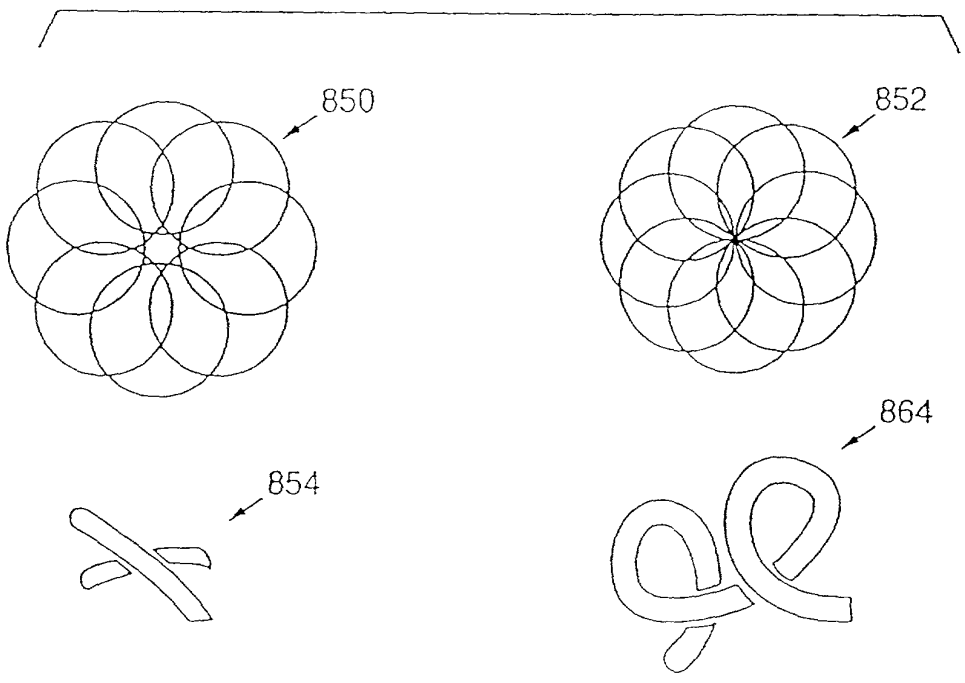
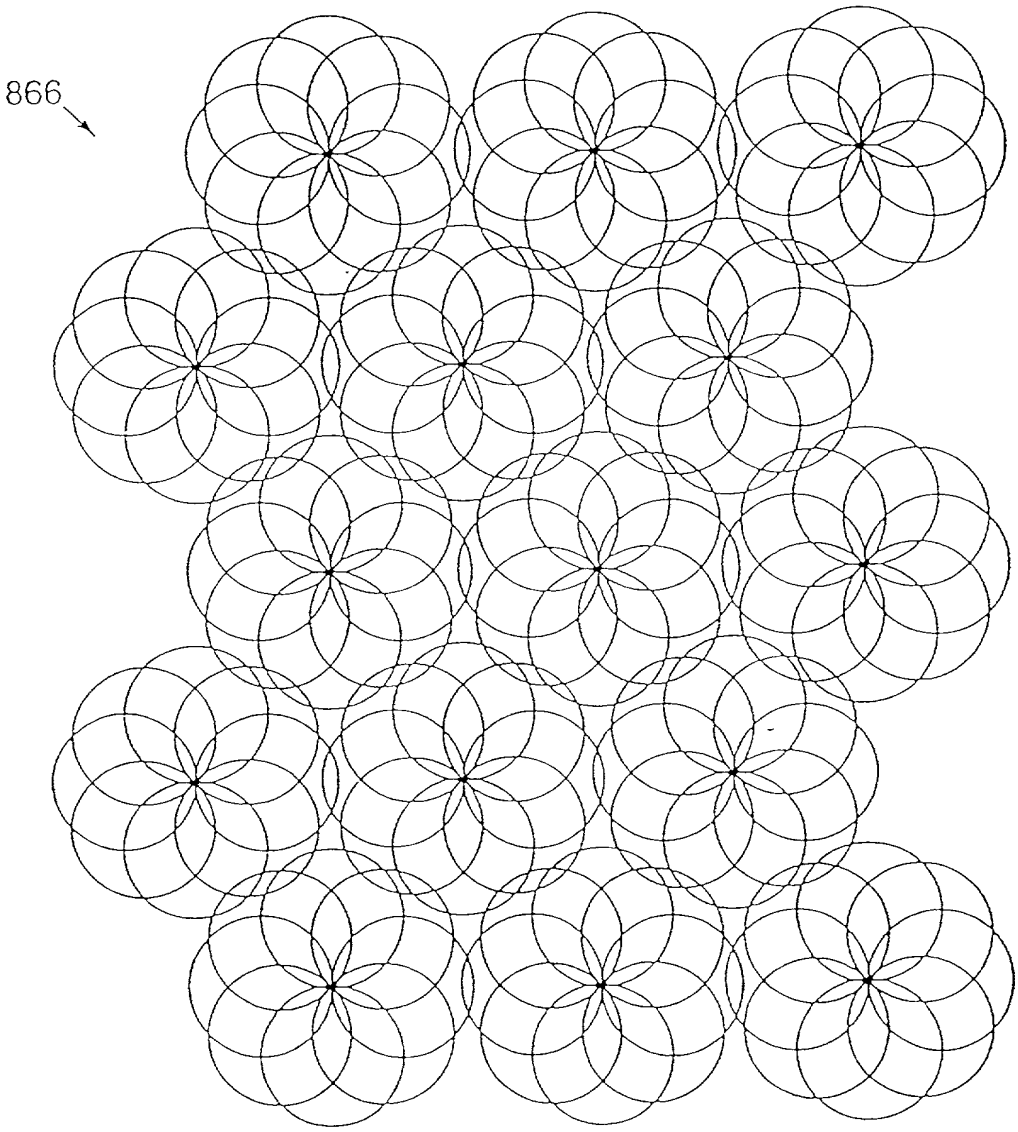


FIG. 19



QUEST FOR MOSAICED KNOT PATTERNS WHICH "COVER" AND ARE COEXTENSIVE WITH ORIGINAL IMAGE;
ALL ELEMENTAL KNOT PATTERNS CAN CONVEY THE SAME INFORMATION, SUCH AS A SIGNATURE, OR EACH CAN CONVEY A NEW MESSAGE IN A STEGANOGRAPHIC SENSE

FIG. 20

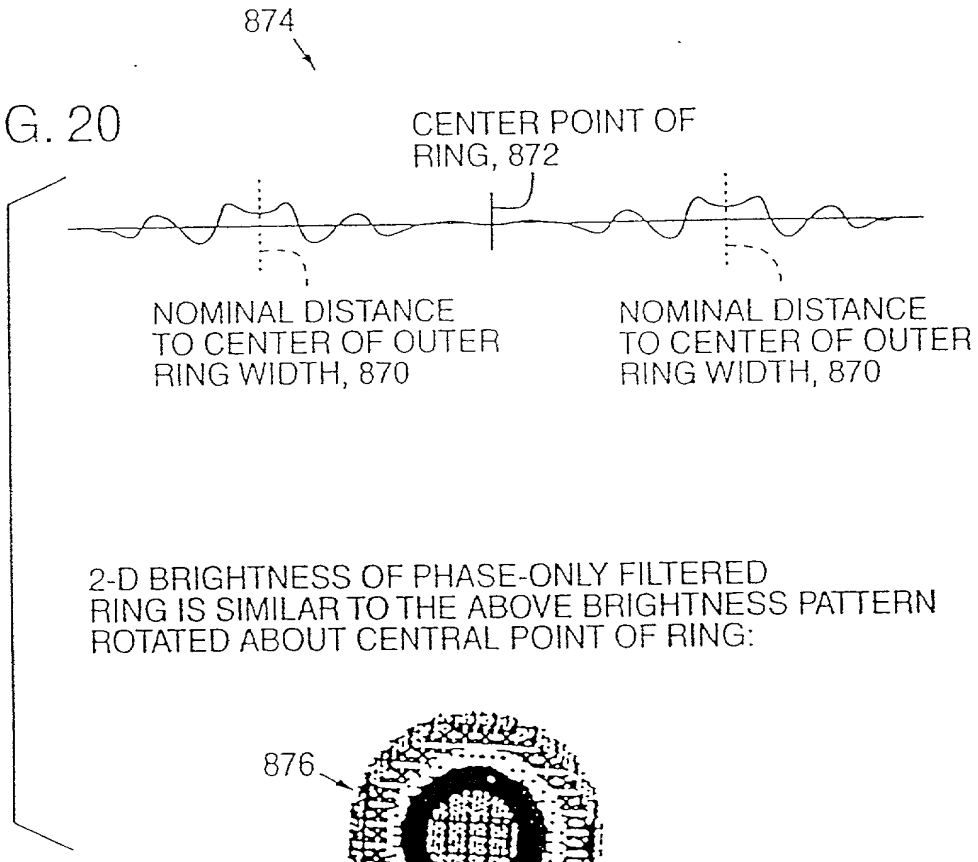

874
CENTER POINT OF RING, 872
NOMINAL DISTANCE TO CENTER OF OUTER RING WIDTH, 870
NOMINAL DISTANCE TO CENTER OF OUTER RING WIDTH, 870
2-D BRIGHTNESS OF PHASE-ONLY FILTERED RING IS SIMILAR TO THE ABOVE BRIGHTNESS PATTERN ROTATED ABOUT CENTRAL POINT OF RING:
876

FIG. 21A

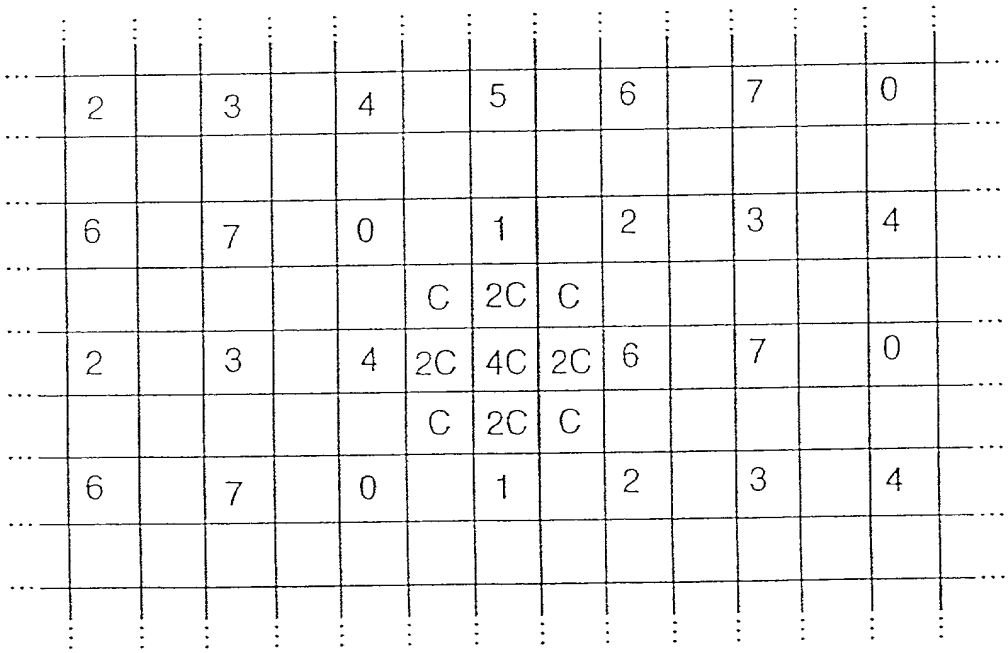
900 →

C	2C	C
2C	4C	2C
C	2C	C

WHERE C = 1/16

ELEMENTARY BUMP
(DEFINED GROUPING OF PIXELS WITH WEIGHT VALUES)

FIG. 21B



EXAMPLE OF HOW MANY ELEMENTARY BUMPS, 900, WOULD BE ASSIGNED LOCATIONS IN AN IMAGE, AND THOSE LOCATIONS WOULD BE ASSOCIATED WITH A CORRESPONDING BIT PLANE IN THE N-BIT WORD, HERE TAKEN AS N=8 WITH INDEXES OF 0-7. ONE LOCATION, ASSOCIATED WITH BIT PLANE "5", HAS THE OVERLAY OF THE BUMP PROFILE DEPICTED.

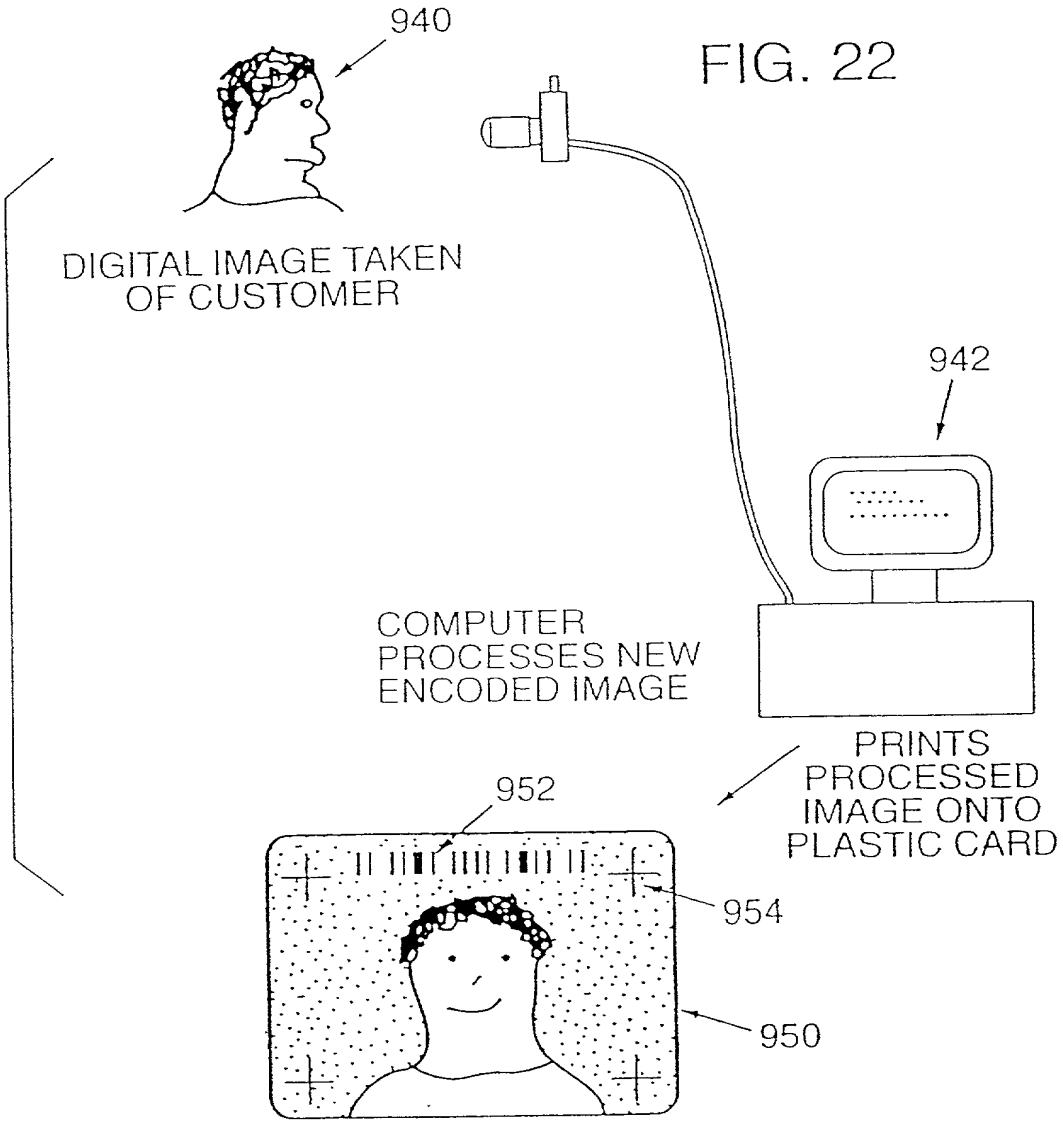
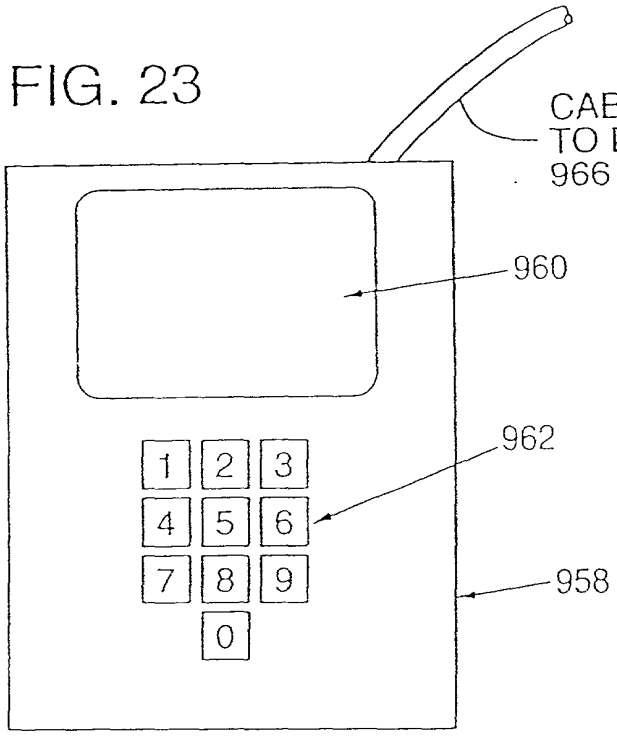

940
DIGITAL IMAGE TAKEN OF CUSTOMER
942
COMPUTER PROCESSES NEW ENCODED IMAGE
PRINTS PROCESSED IMAGE ONTO PLASTIC CARD
952
954
950

FIG. 22

FIG. 23



CONTAINS RUDIMENTARY OPTICAL SCANNER, MEMORY BUFFERS, COMMUNICATIONS DEVICES, AND MICROPROCESSOR

CONSUMER MERELY PLACES CARD INTO WINDOW AND CAN, AT THEIR PREARRANGED OPTION, EITHER TYPE IN A PERSONAL IDENTIFICATION NUMBER (PIN, FOR ADDED SECURITY) OR NOT. THE TRANSACTION IS APPROVED OR DISAPPROVED WITHIN SECONDS.

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FIG. 24

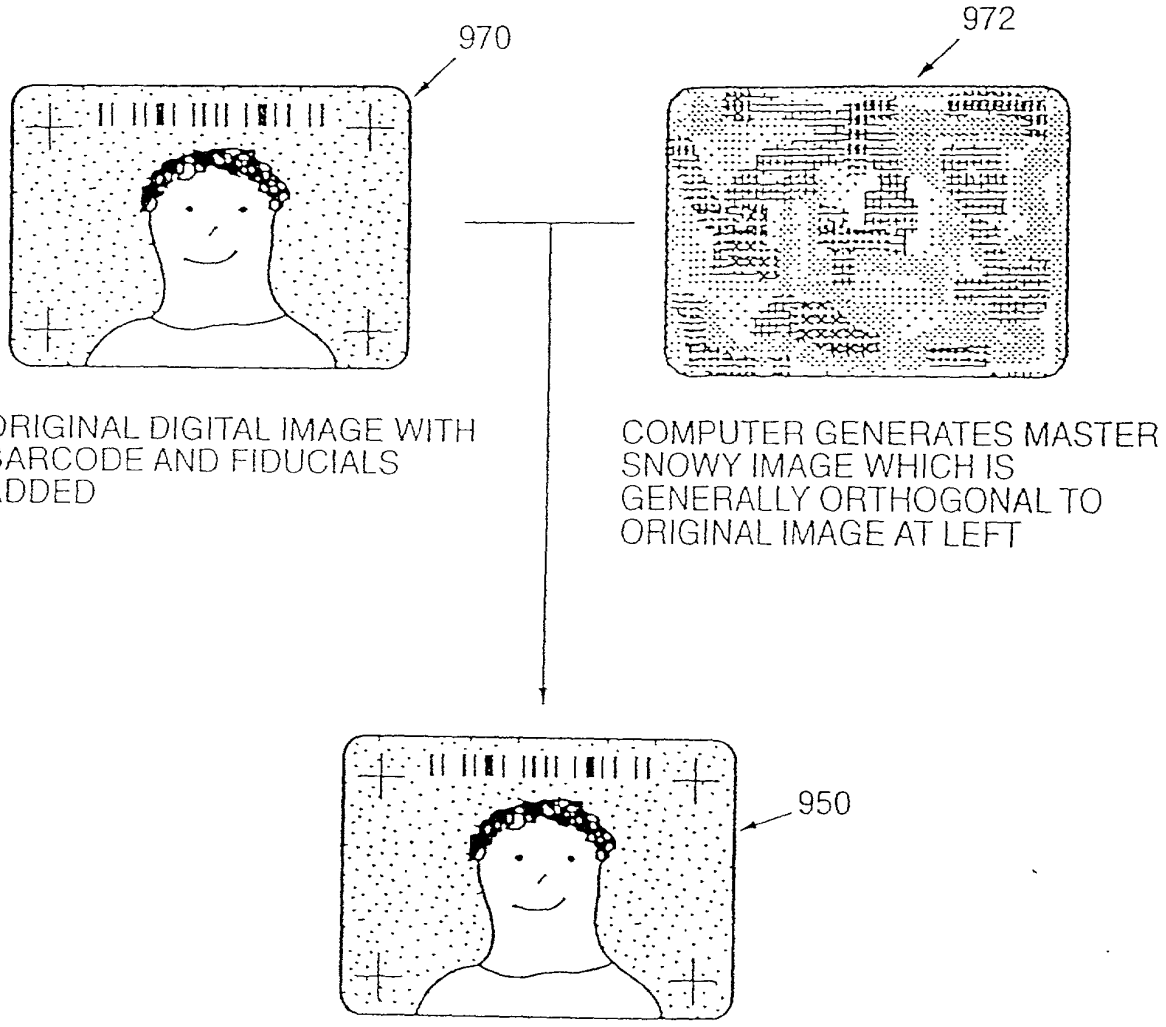

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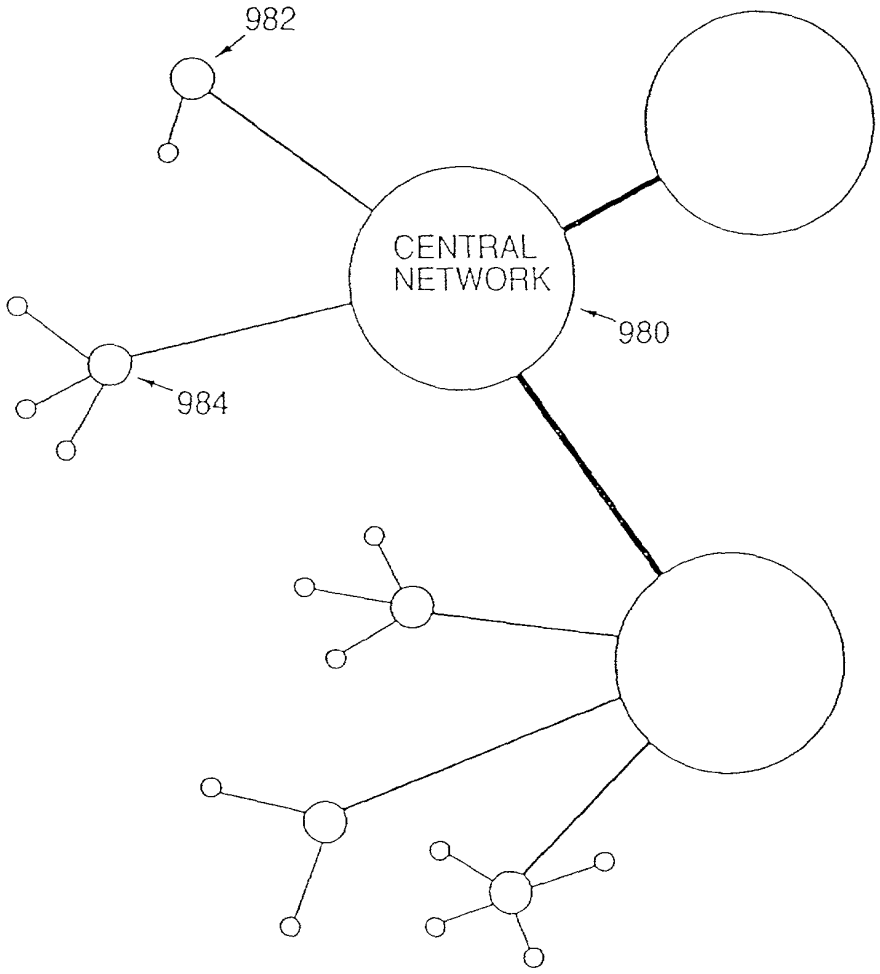
FIG. 25 TYPICAL TRANSACTION STEPS

1. READER SCANS IMAGE ON CARD, STORES IN MEMORY, EXTRACTS PERSON'S ID
2. OPTIONAL: USER KEYS IN PIN NUMBER
3. READER CALLS CENTRAL ACCOUNT DATA NETWORK, HANDSHAKES
4. READER SENDS ID, (PIN), MERCHANT INFORMATION, AND REQUESTED TRANSACTION AMOUNT TO CENTRAL NETWORK
5. CENTRAL NETWORK VERIFIES ID, PIN, MERCHANT INFO, AND ACCOUNT BALANCE
6. IF OK, CENTRAL NETWORK GENERATES TWENTY-FOUR SETS OF SIXTEEN DISTINCT RANDOM NUMBERS, WHERE THE RANDOM NUMBERS ARE INDEXES TO A SET OF 64K ORTHOGONAL SPATIAL PATTERNS
7. CENTRAL NETWORK TRANSMITS FIRST OK, AND THE SETS OF RANDOM NUMBERS
8. READER STEPS THROUGH THE TWENTY-FOUR SETS
   - 8A. READER ADDS TOGETHER SET OF ORTHOGONAL PATTERNS
   - 8B. READER PERFORMS DOT PRODUCT OF RESULTANT PATTERN AND CARD SCAN, STORES RESULT
9. READER TRANSMITS THE TWENTY-FOUR DOT PRODUCT RESULTS TO CENTRAL NETWORK
10. CENTRAL NETWORK CHECKS RESULTS AGAINST MASTER
11. CENTRAL NETWORK SENDS FINAL APPROVAL OR DENIAL
12. CENTRAL NETWORK DEBITS MERCHANT ACCOUNT, CREDITS CARD ACCOUNT

FIG. 26

THE NEGLIGIBLE-FRAUD CASH CARD SYSTEM



A BASIC FOUNDATION OF THE CASH CARD SYSTEM IS A 24-HOUR INFORMATION NETWORK, WHERE BOTH THE STATIONS WHICH CREATE THE PHYSICAL CASH CARDS, 950, AND THE POINT-OF-SALES, 984, ARE ALL HOOKED UP TO THE SAME NETWORK CONTINUOUSLY

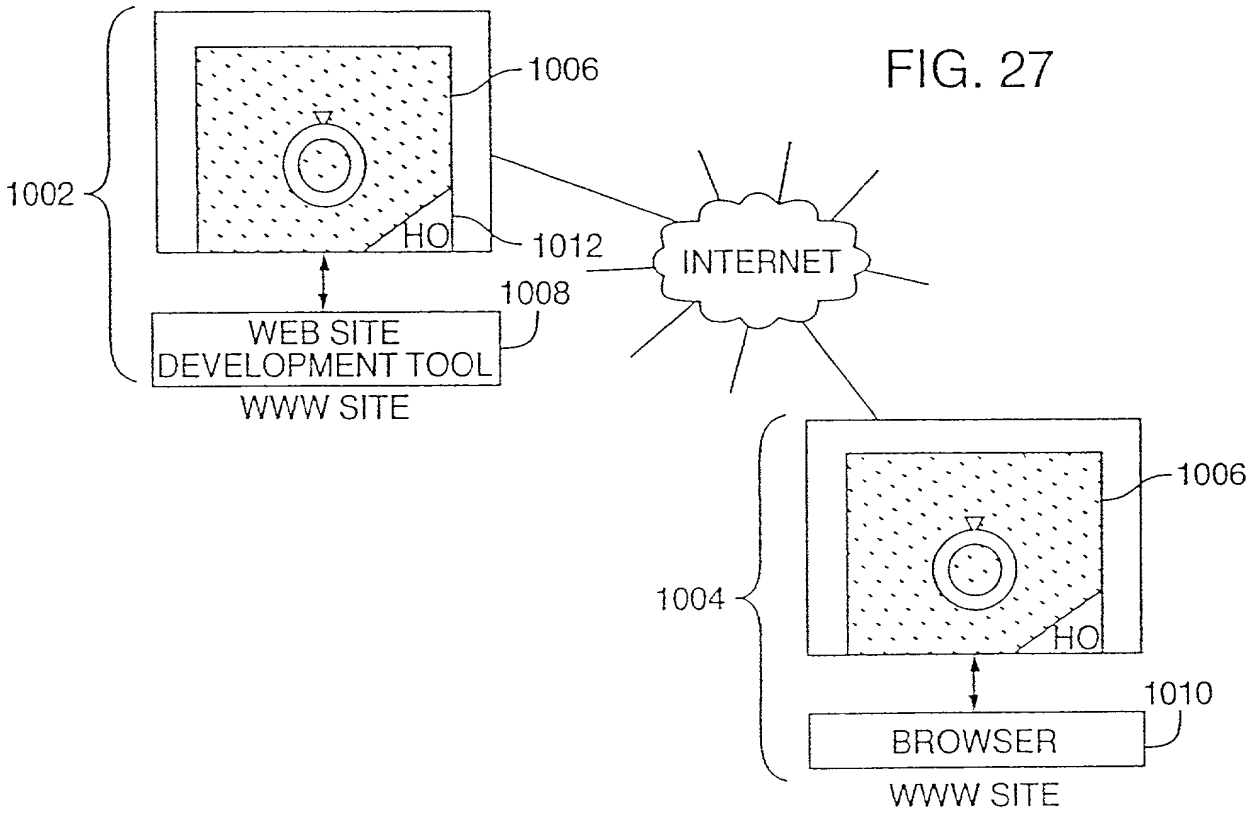

1002
1006
HO
1012
INTERNET
1008
WEB SITE
DEVELOPMENT TOOL
WWW SITE
1004
1006
HO
1010
BROWSER
WWW SITE

FIG. 27

FIG. 28

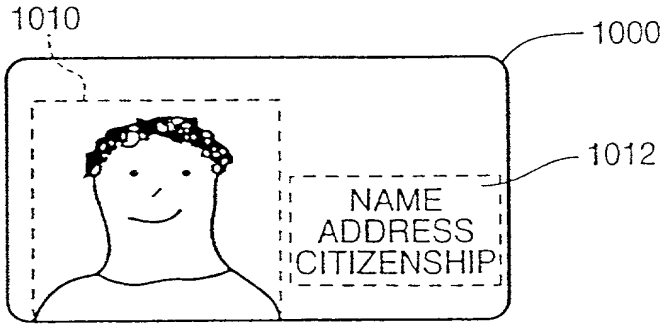

1010
1000
1012
NAME
ADDRESS
CITIZENSHIP

FIG. 27A

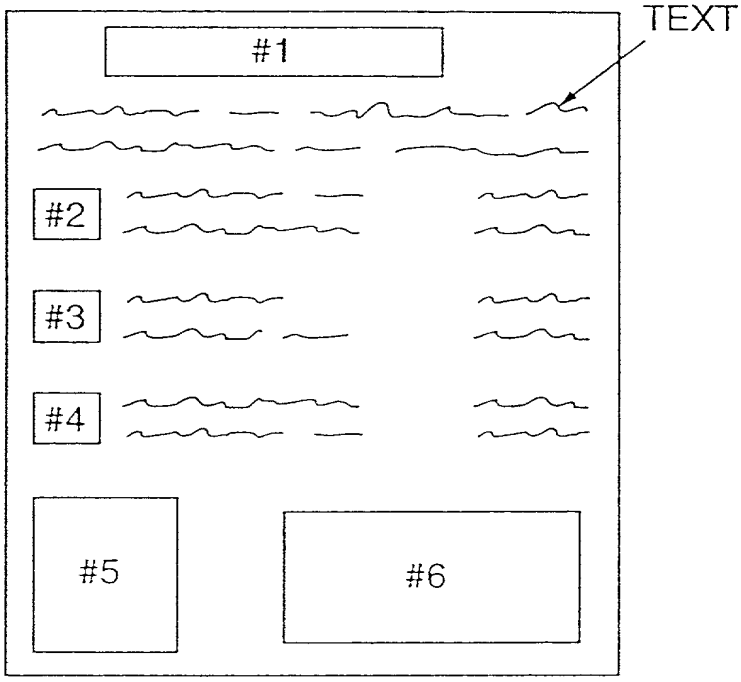


FIG. 27B

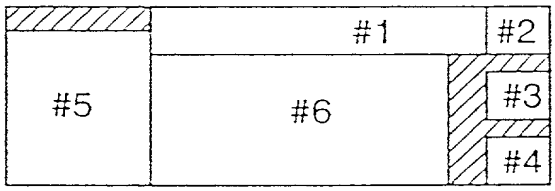
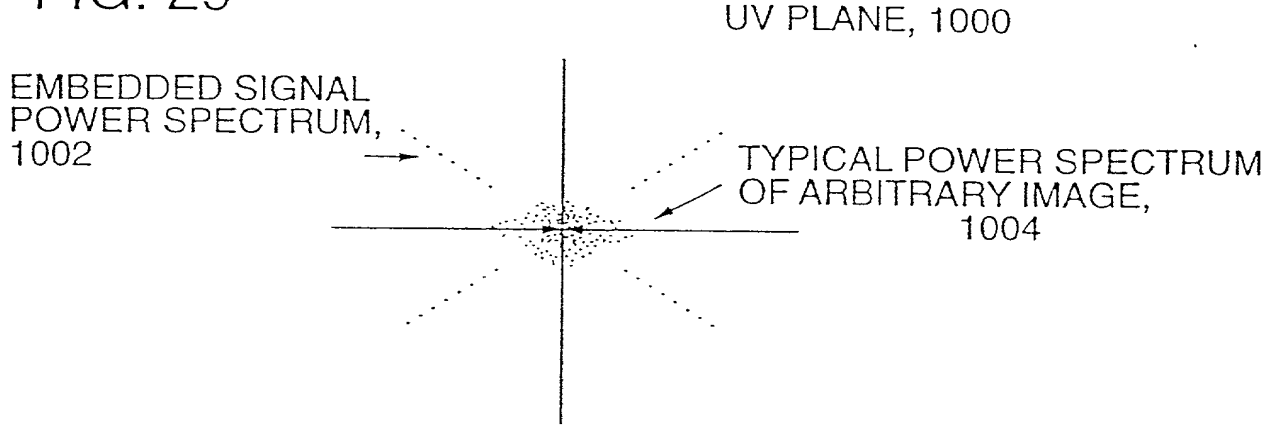
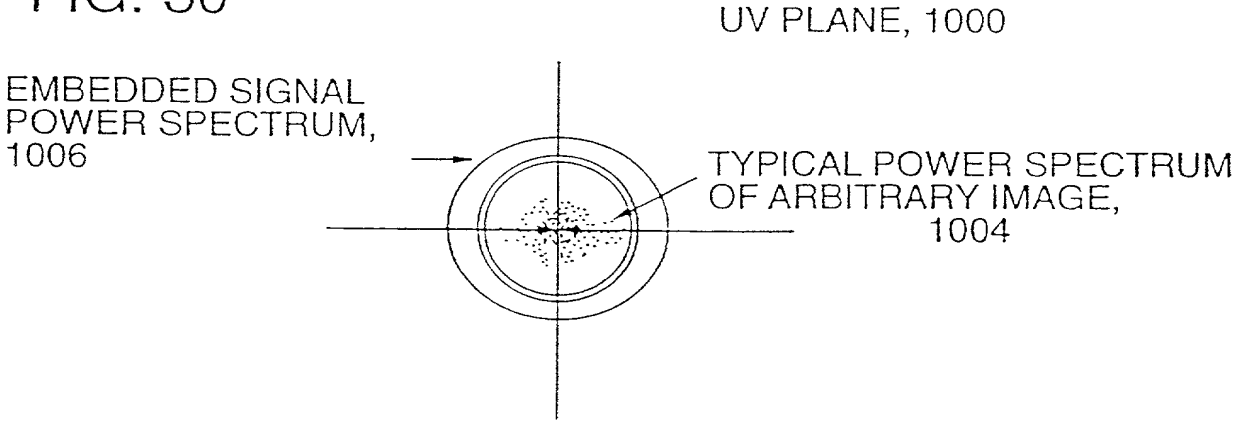


FIG. 29



NON-HARMONIC SPATIAL FREQUENCIES ALONG THE 45 DEGREE AXES, GIVING RISE TO A WEAVE-LIKE CROSS-HATCHING PATTERN IN THE SPATIAL DOMAIN

FIG. 30



NON-HARMONIC CONCENTRIC CIRCLES IN UV PLANE, WHERE PHASE HOPS QUASI-RANDOMLY ALONG EACH CIRCLE, GIVING RISE TO PSEUDO RANDOM LOOKING PATTERNS IN THE SPATIAL DOMAIN

FIG. 29A

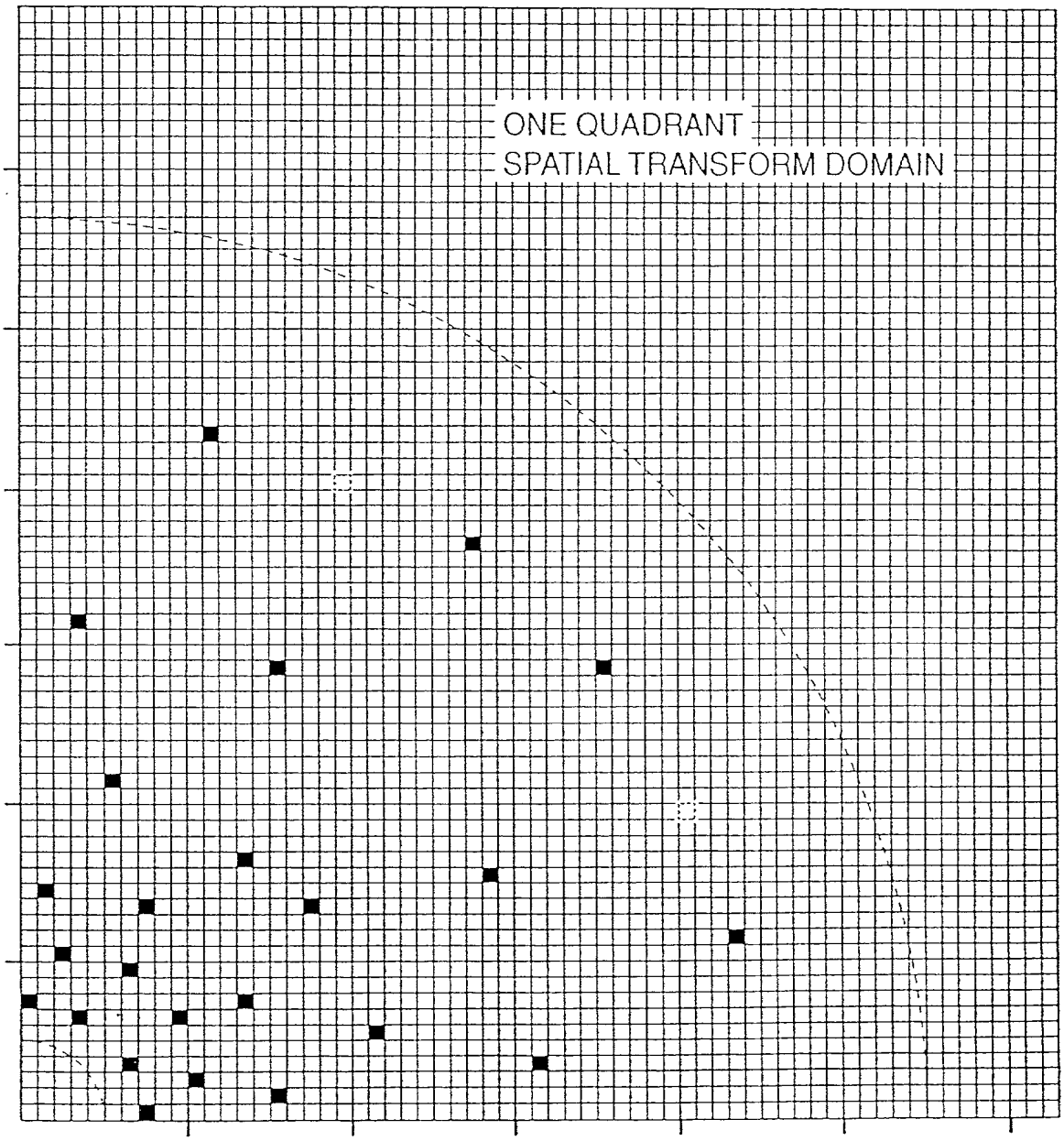
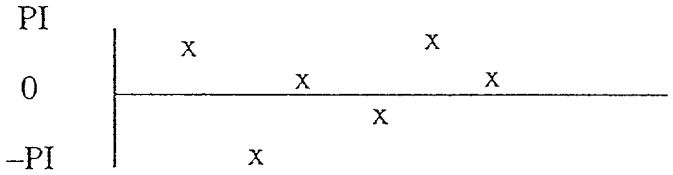
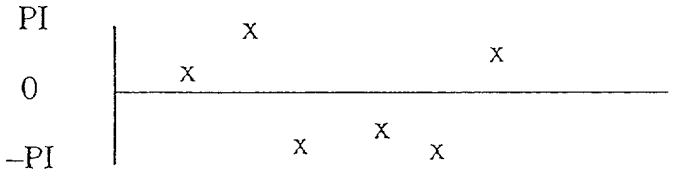


FIG. 31A



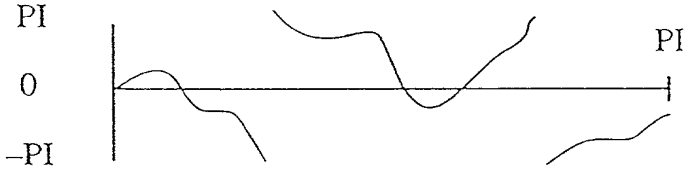
PHASE OF SPATIAL FREQUENCIES ALONG FORWARD 45 DEGREE AXES, 1008

FIG. 31B



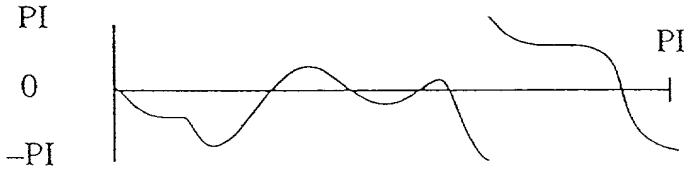
PHASE OF SPATIAL FREQUENCIES ALONG BACKWARD 45 DEGREE AXES, 1010

FIG. 32A



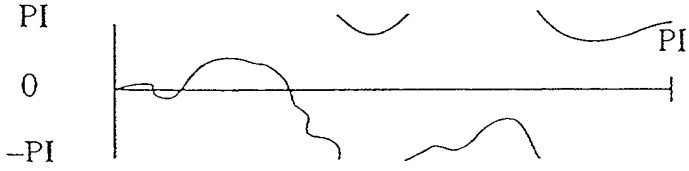
PHASE OF SPATIAL FREQUENCIES ALONG FIRST CONCENTRIC RING, 1012

FIG. 32B



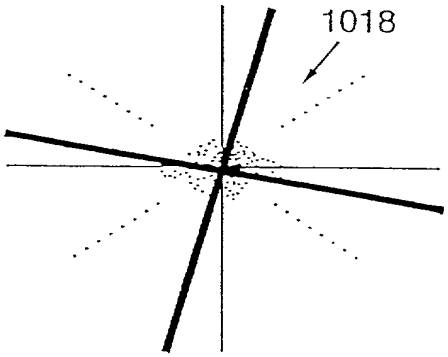
PHASE OF SPATIAL FREQUENCIES ALONG SECOND CONCENTRIC RING, 1014

FIG. 32C



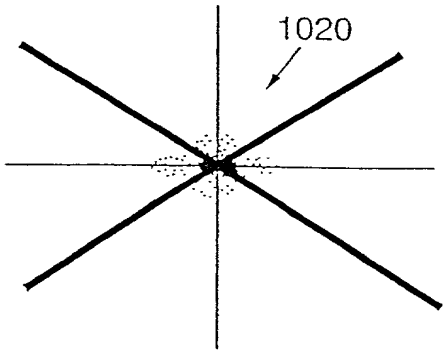
PHASE OF SPATIAL FREQUENCIES ALONG THIRD CONCENTRIC RING, 1016

FIG. 33A



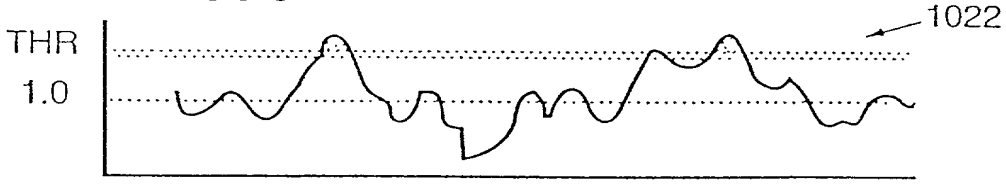
ANGLE A

FIG. 33B



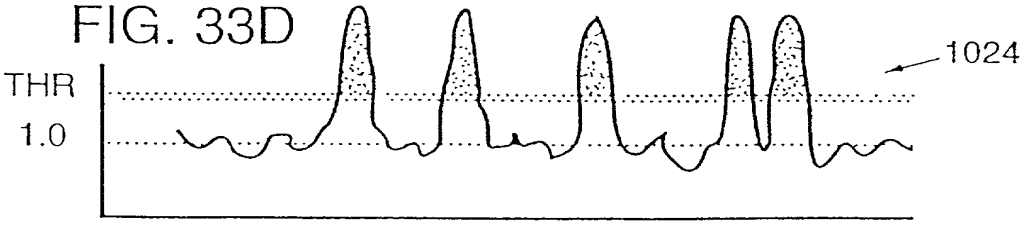
ANGLE B

FIG. 33C



POWER PROFILE ALONG ANGLE A, AS NORMALIZED BY ITS OWN MOVING AVERAGE; ONLY A MINIMAL AMOUNT EXCEEDS THRESHOLD, GIVING A SMALL INTEGRATED VALUE

FIG. 33D



POWER PROFILE ALONG ANGLE B, AS NORMALIZED BY ITS OWN MOVING AVERAGE; THIS FINDS STRONG ENERGY ABOVE THE THRESHOLD

FIG. 33E

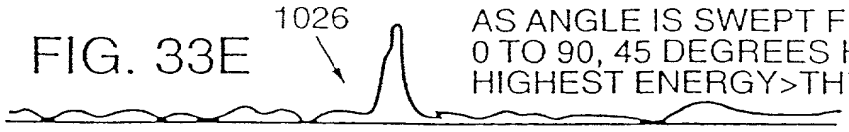


FIG. 34A

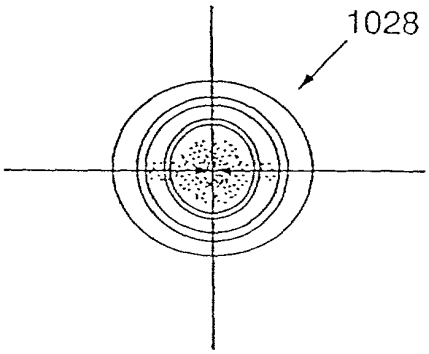


FIG. 34B

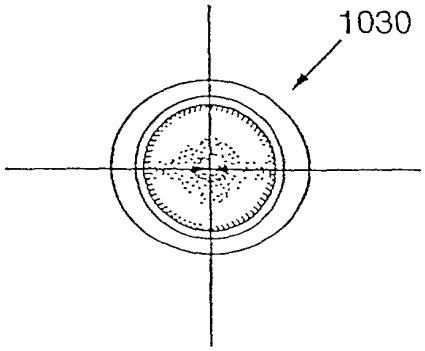
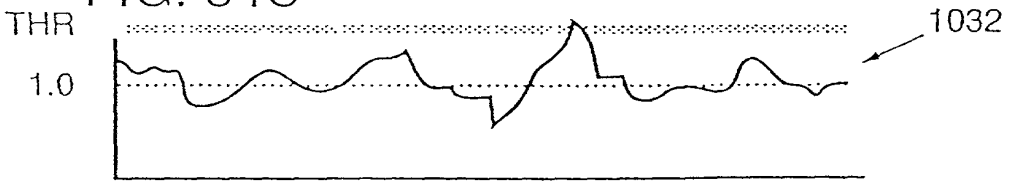
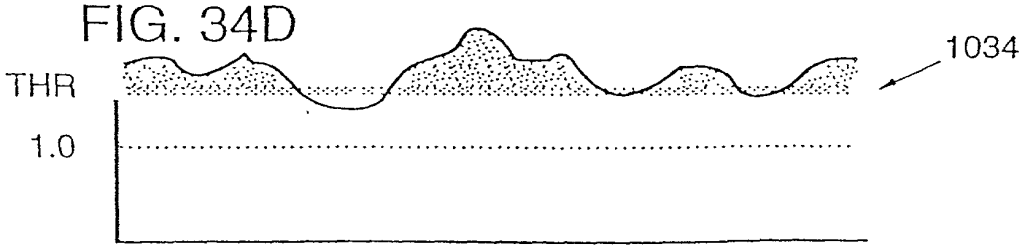


FIG. 34C



POWER PROFILE ALONG CIRCLE AT RADIUS A

FIG. 34D



POWER PROFILE ALONG CIRCLE AT RADIUS B

FIG. 34E

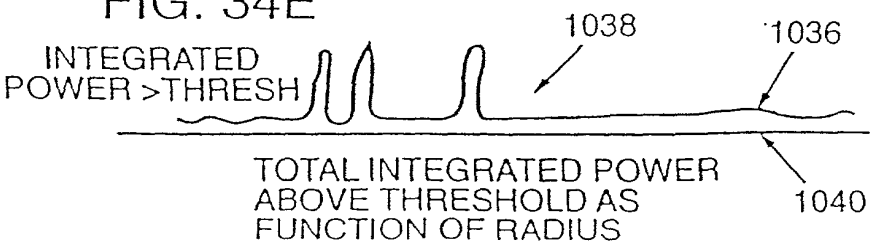
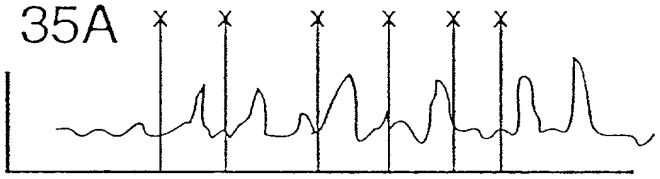
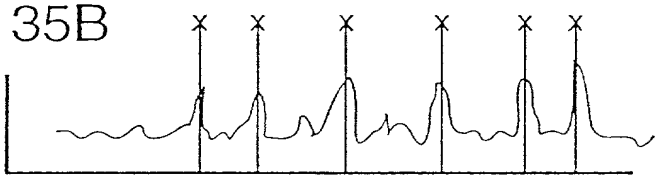


FIG. 35A



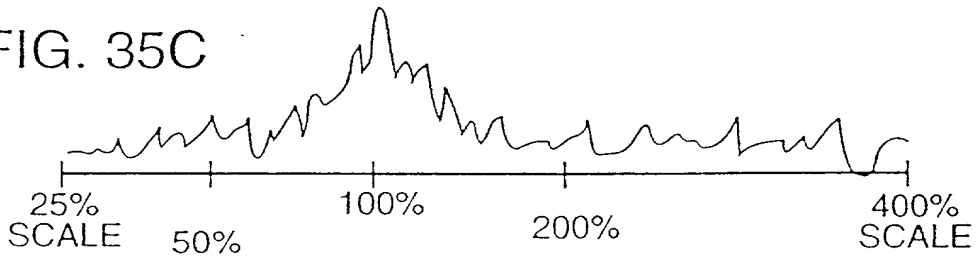
SCALE = A; ADD ALL POWER VALUES AT THE "KNOWN" FREQUENCIES", 1042

FIG. 35B



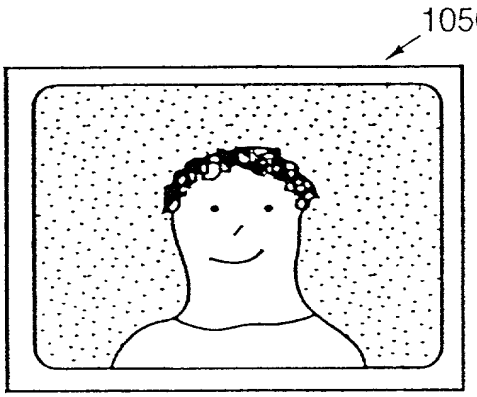
SCALE = B; ADD ALL POWER VALUES AT THE "KNOWN" FREQUENCIES", 1044

FIG. 35C



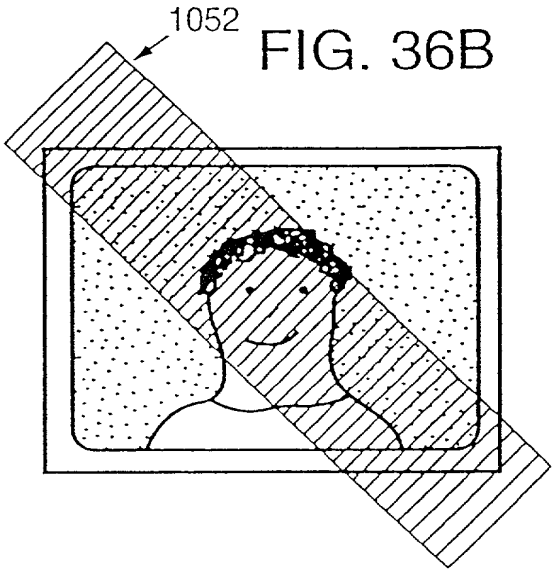
"SCALED-KERNEL" BASED MATCHED FILTER; PEAK IS WHERE THE SCALE OF THE SUBLIMINAL GRID WAS FOUND, 1046

FIG. 36A



ARBITRARY ORIGINAL IMAGE
IN WHICH SUBLIMINAL
GRATICULES MAY HAVE BEEN PLACED

FIG. 36B



"COLUMN SCAN"
IS APPLIED ALONG A
GIVEN ANGLE THROUGH
THE CENTER OF THE
IMAGE

FIG. 36C

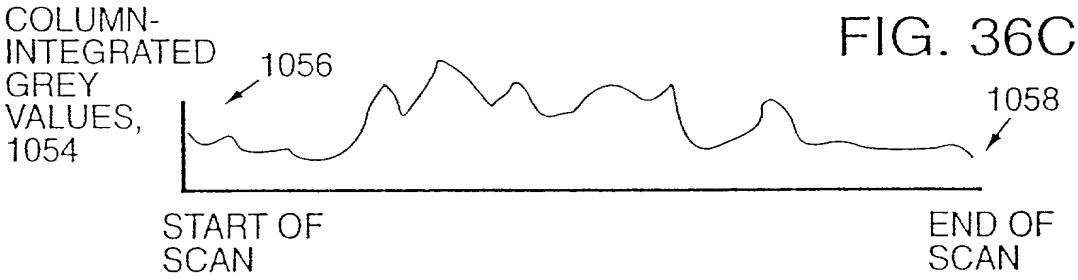
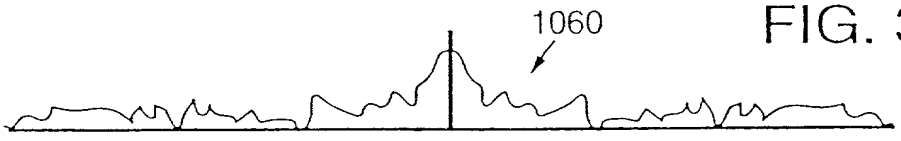


FIG. 36D



MAGNITUDE OF FOURIER TRANSFORM OF SCAN DATA

Petitioner's Exhibit 1009, Page 50

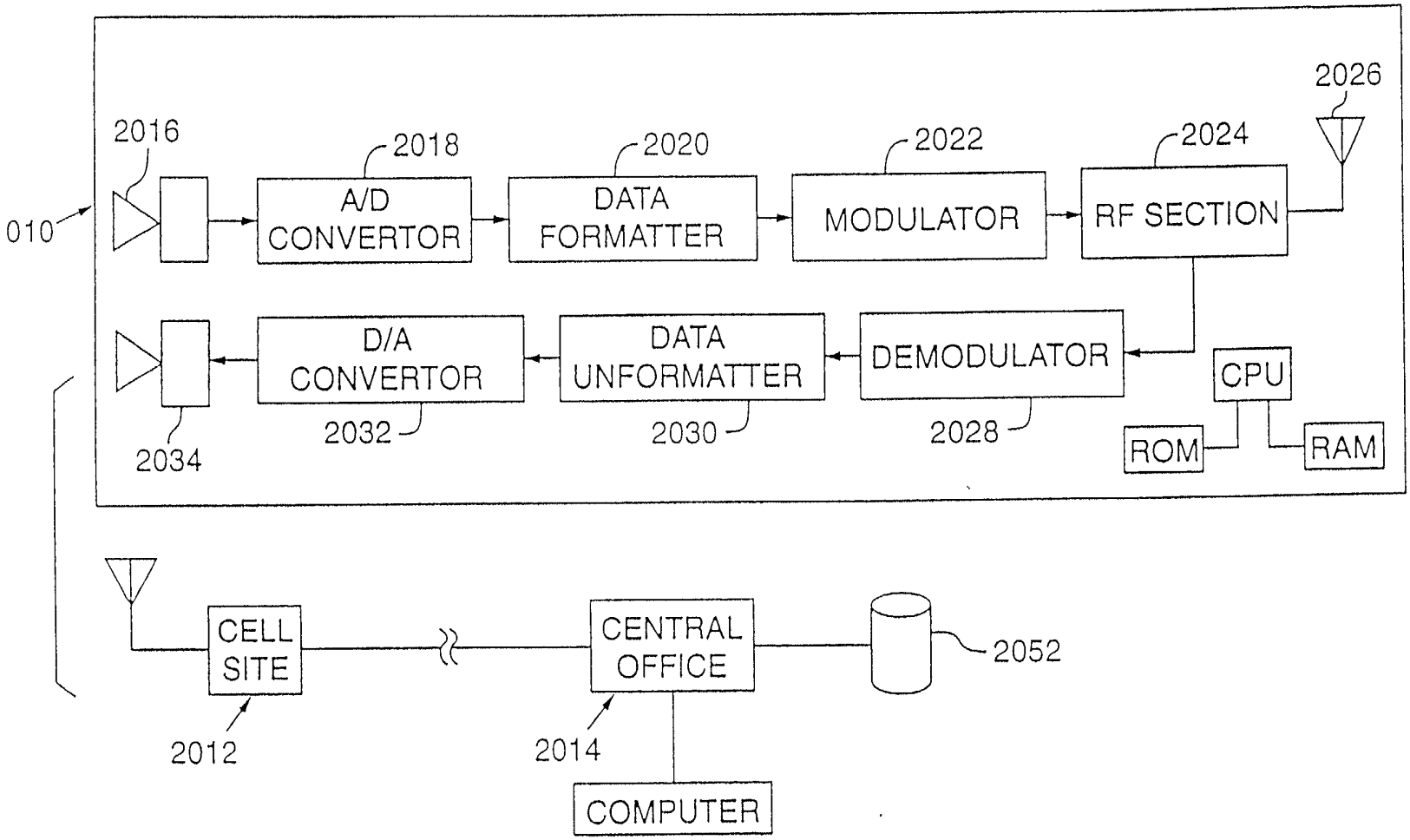
FIG. 37

PROCESS STEPS

1. SCAN IN PHOTOGRAPH
2. 2D FFT
3. GENERATE 2D POWER SPECTRUM, FILTER WITH E.G. 3X3 BLURRING KERNEL
4. STEP ANGLES FROM 0 DEGREES THROUGH 90 (1/2 DEG)
5. GENERATE NORMALIZED VECTOR, WITH POWER VALUE AS NUMERATOR, AND MOVING AVERAGED POWER VALUE AS DENOMINATOR
6. INTEGRATE VALUES AS SOME THRESHOLD, GIVING A SINGLE INTEGRATED VALUE FOR THIS ANGLE
7. END STEP ON ANGLES
8. FIND TOP ONE OR TWO OR THREE "PEAKS" FROM THE ANGLES IN LOOP 4, THEN FOR EACH PEAK...
9. STEP SCALE FROM 25% TO 400%, STEP ~1.01
10. ADD THE NORMALIZED POWER VALUES CORRESPONDING TO THE 'N' SCALED FREQUENCIES OF STANDARD
11. KEEP TRACK OF HIGHEST VALUE IN LOOP
12. END LOOP 9 AND 8, DETERMINE HIGHEST VALUE
13. ROTATION AND SCALE NOW FOUND
14. PERFORM TRADITIONAL MATCHED FILTER TO FIND EXACT SPATIAL OFFSET
15. PERFORM ANY "FINE TUNING" TO PRECISELY DETERMINE ROTATION, SCALE, OFFSET

US 6,466,695 B1

FIG. 38


010
2016
2018
A/D CONVERTOR
2020
DATA FORMATTER
2022
MODULATOR
2024
RF SECTION
2026
2034
D/A CONVERTOR
2032
DATA UNFORMATTER
2030
DEMODULATOR
2028
CPU
ROM
RAM
CELL SITE
2012
CENTRAL OFFICE
2014
2052
COMPUTER

TOS280 5,825,660

FIG. 39

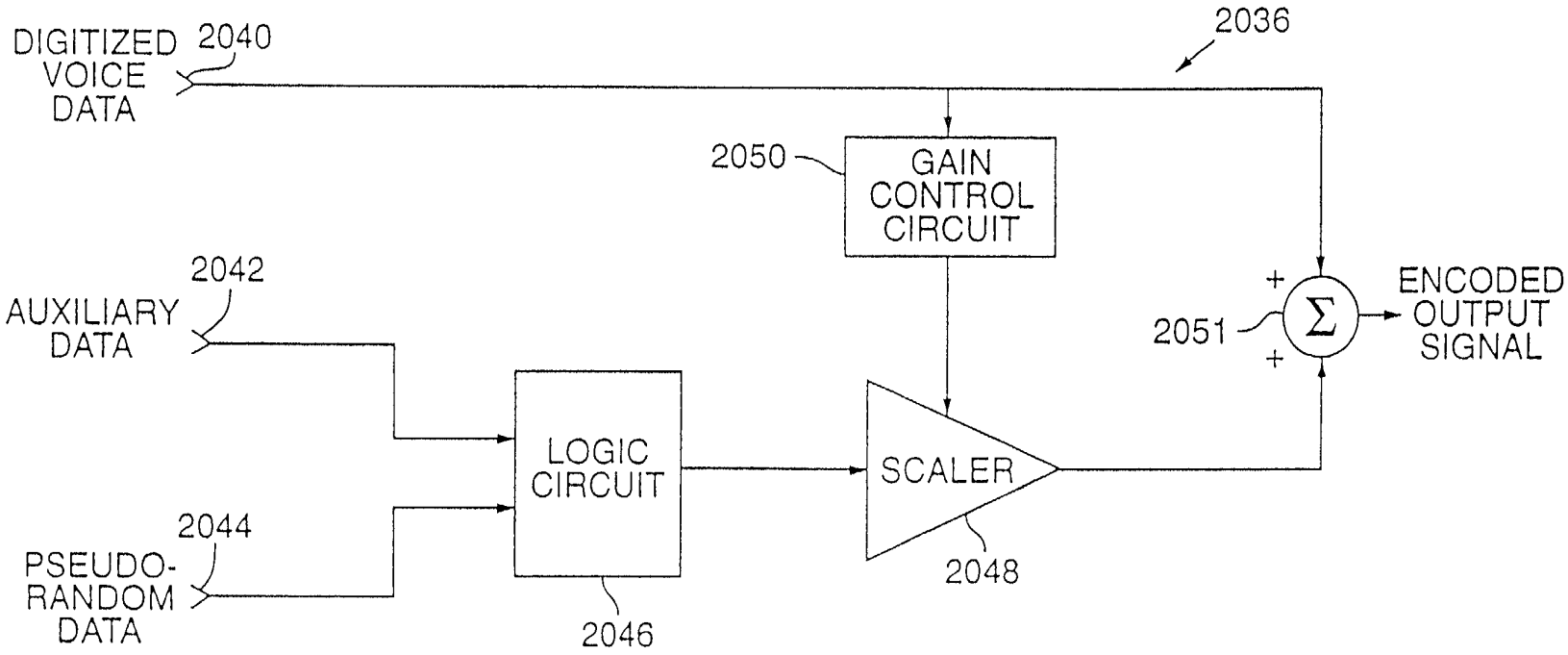


FIG. 40

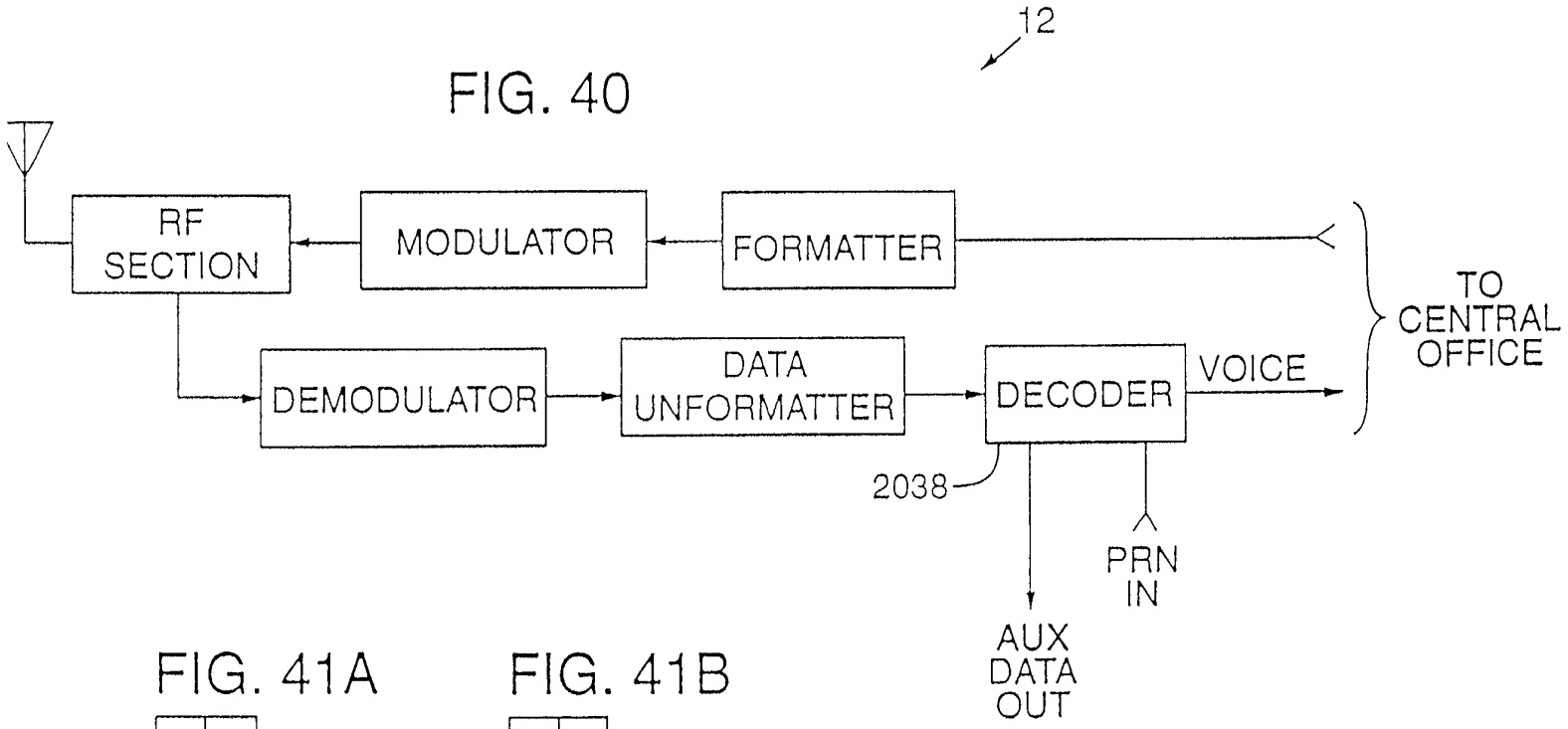


FIG. 41A

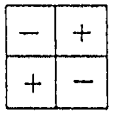
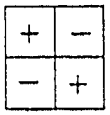


FIG. 41B



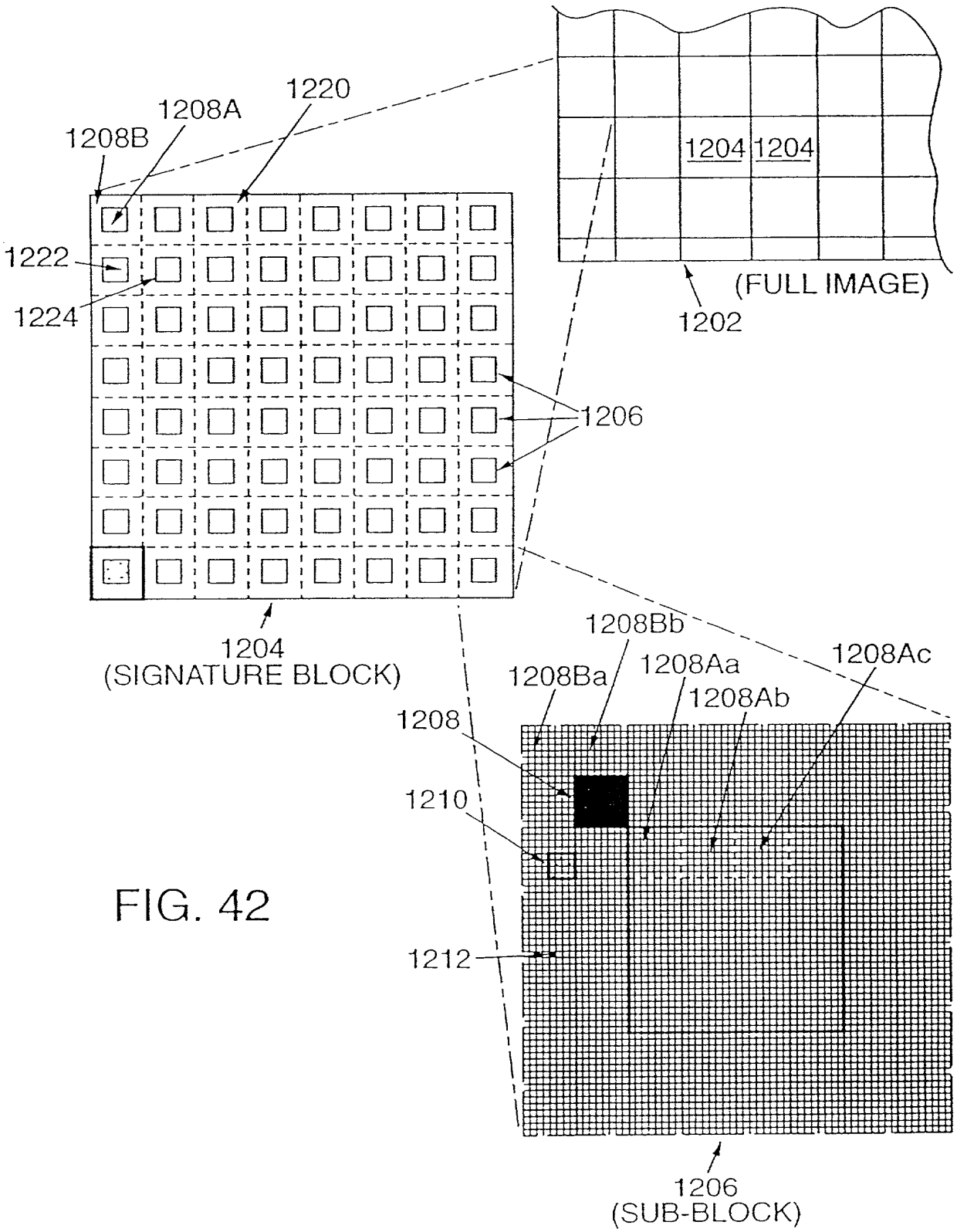
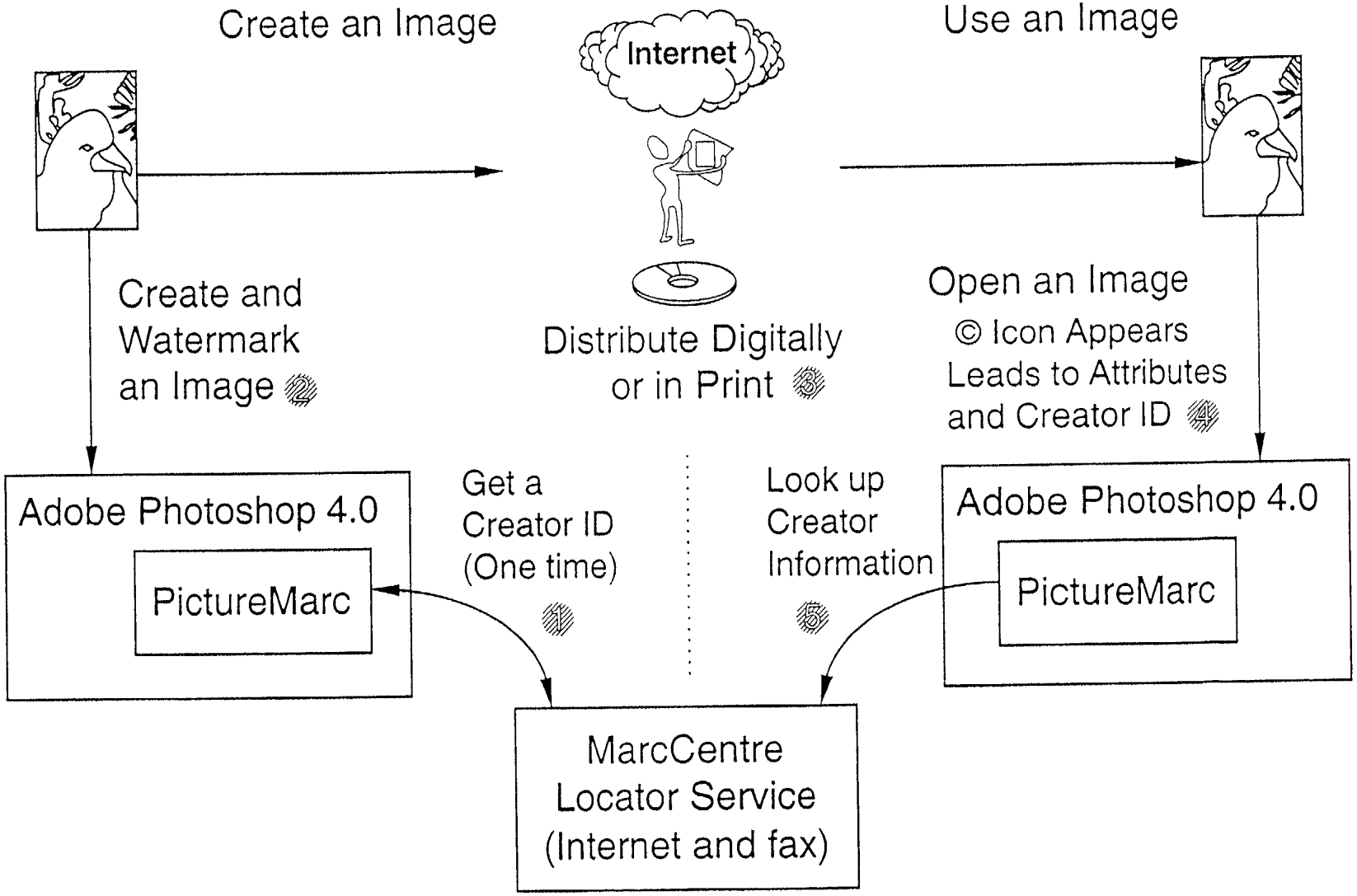
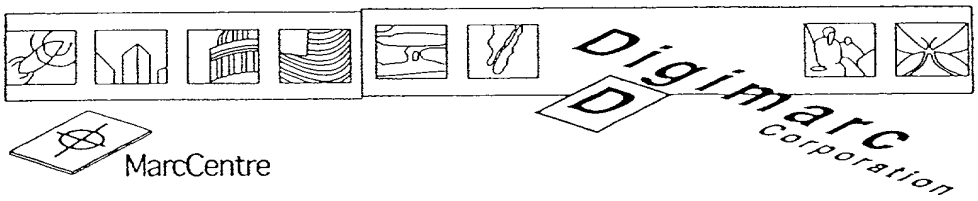

1220
1208A
1208B
1222
1224
1204
1204
(FULL IMAGE)
1202
1206
1204
(SIGNATURE BLOCK)
1208Bb
1208Ba
1208Aa
1208Ac
1208Ab
1208
1210
1212
1206
(SUB-BLOCK)

FIG. 42

FIG. 43


Create an Image
Internet
Use an Image
Create and
Watermark
an Image 2
Distribute Digitally
or in Print 3
Open an Image
© Icon Appears
Leads to Attributes
and Creator ID 4
Adobe Photoshop 4.0
PictureMarc
Get a
Creator ID
(One time)
1
Look up
Creator
Information
5
Adobe Photoshop 4.0
PictureMarc
MarcCentre
Locator Service
(Internet and fax)



Photoshop 4.0 Offer

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FIG. 44

To find out more about how MarcCentre works and how you can get started taking advantage of this locator service, browse the MarcCentre overview page.

If you are already a subscriber, you can go to Member Services to view or update your contact details.

To look up image creator/distributor information, you can search by creator ID or by other, more general, criteria.

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Company
Address
City
State/Province
Zip/Postal Code
Country
Phone Number
Fax Number
Email Address
Your Home Page http://

FIG. 45

You can control how much of your contact information is displayed when a potential customer finds your profile on MarcCentre. Use the selections below to tell us what you want people to see.

Phone Number	**Mailing Address**	**Email Account**
(•) Show	(•) Show	(•) Show
( ) Don't show	( ) Don't show	( ) Don't show

Yes, I want to be on your mailing lists [X]

Please select your profession (one only).

(•) Photographer
( ) **Illustrator**
( ) Other

In order to communicate your primary area of focus or specialty to potential customers, please select one of the options from the list below -or- type in your own in the space next to "Custom Specialty"

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Illustrator (none)

Custom Specialty

09543365 020304

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For security purposes, you will need to setup a password that allows you to edit your profile information. This password along with your creator ID are required before you can update your contact information.

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Card Number **Name Shown on Card** **Expiration (MM/YY)**

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Part 1 Complete

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FIG. 46

FIG. 47

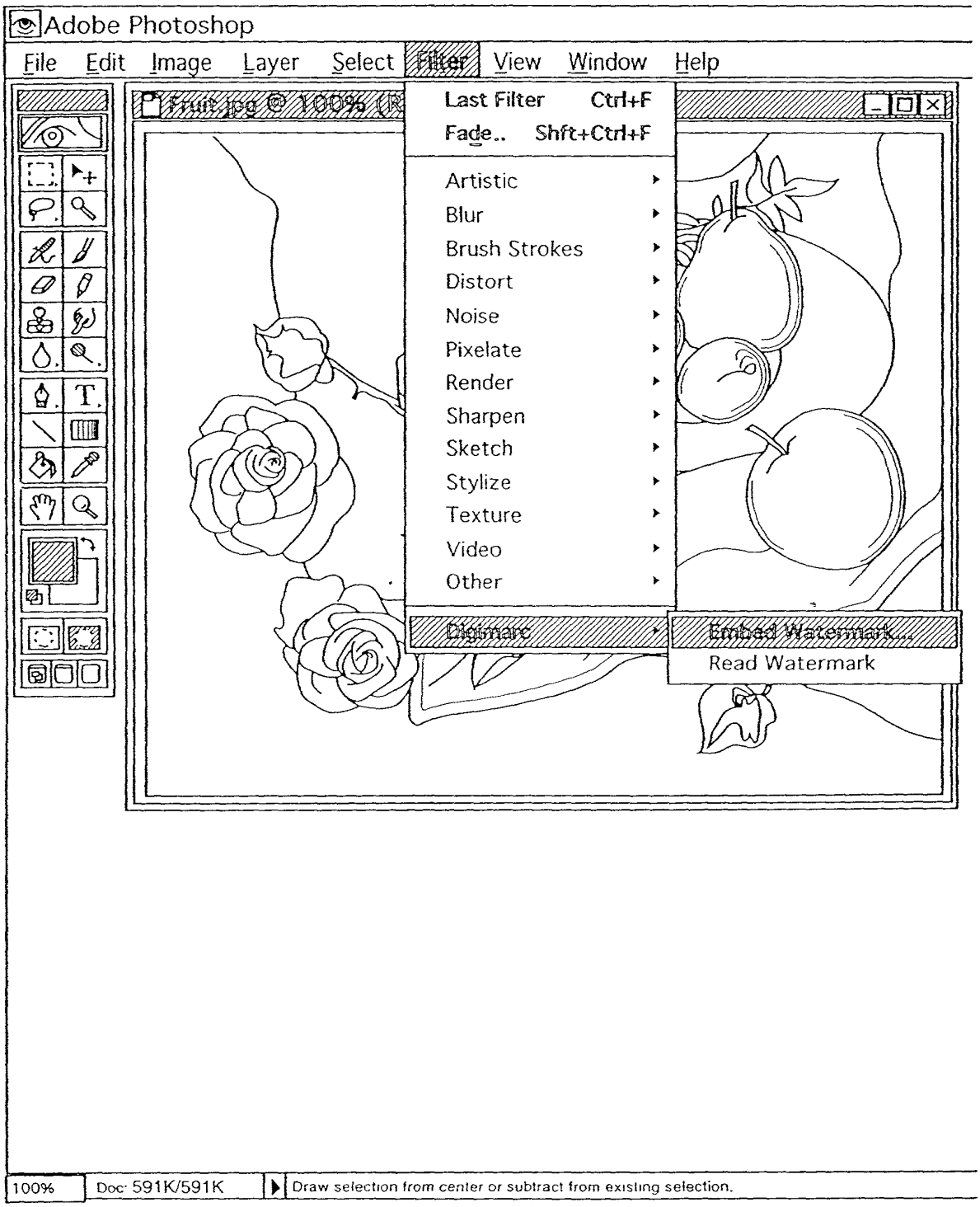
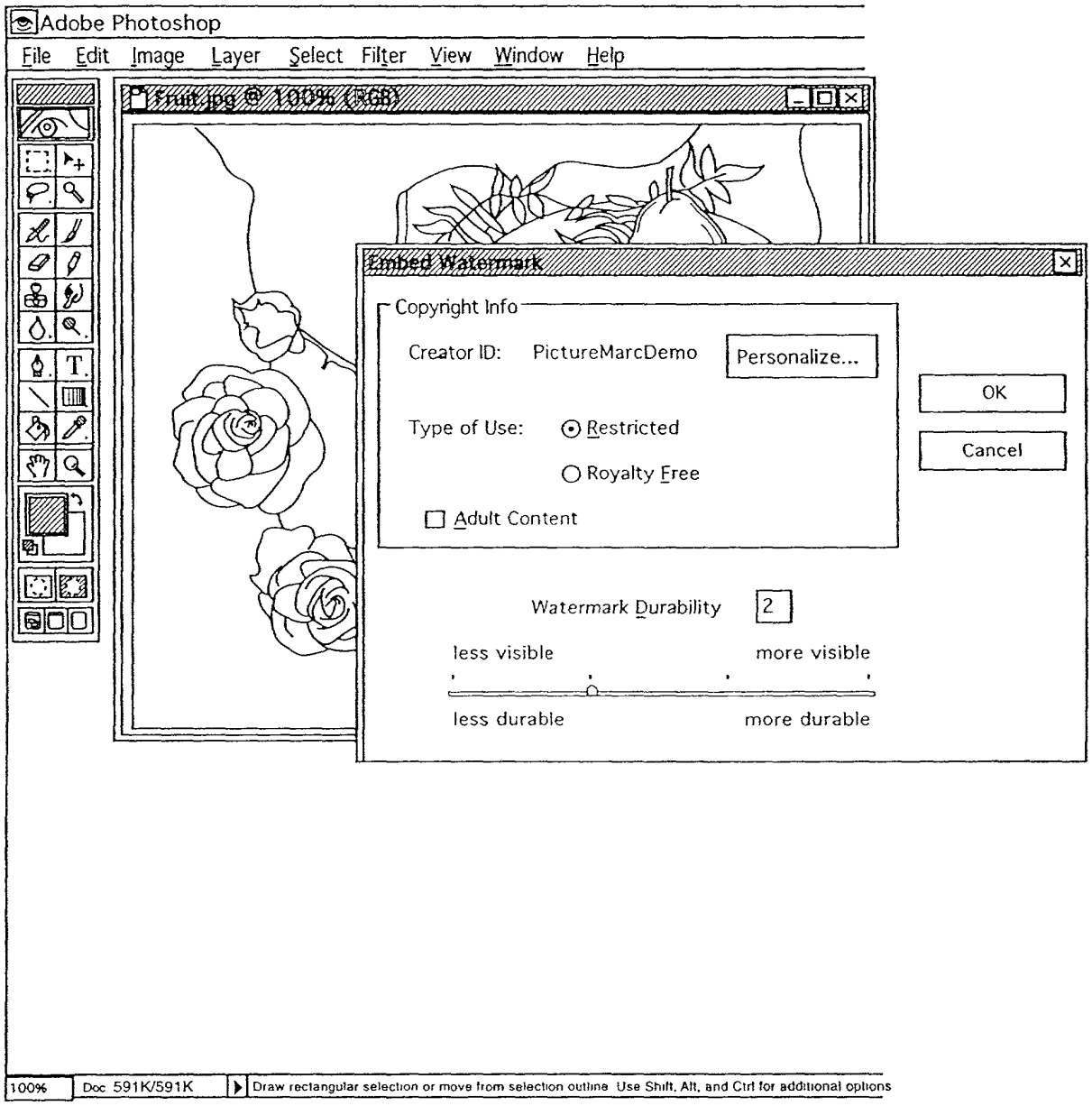

Adobe Photoshop
File Edit Image Layer Select Filter View Window Help
Fruit.jpg @ 100% (R
Last Filter Ctrl+F
Fade.. Shft+Ctrl+F
Artistic
Blur
Brush Strokes
Distort
Noise
Pixelate
Render
Sharpen
Sketch
Stylize
Texture
Video
Other
Digimarc
Embed Watermark...
Read Watermark
100%
Doc: 591K/591K
Draw selection from center or subtract from existing selection.

FIG. 48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File Edit Image Layer Select Filter View Window Help
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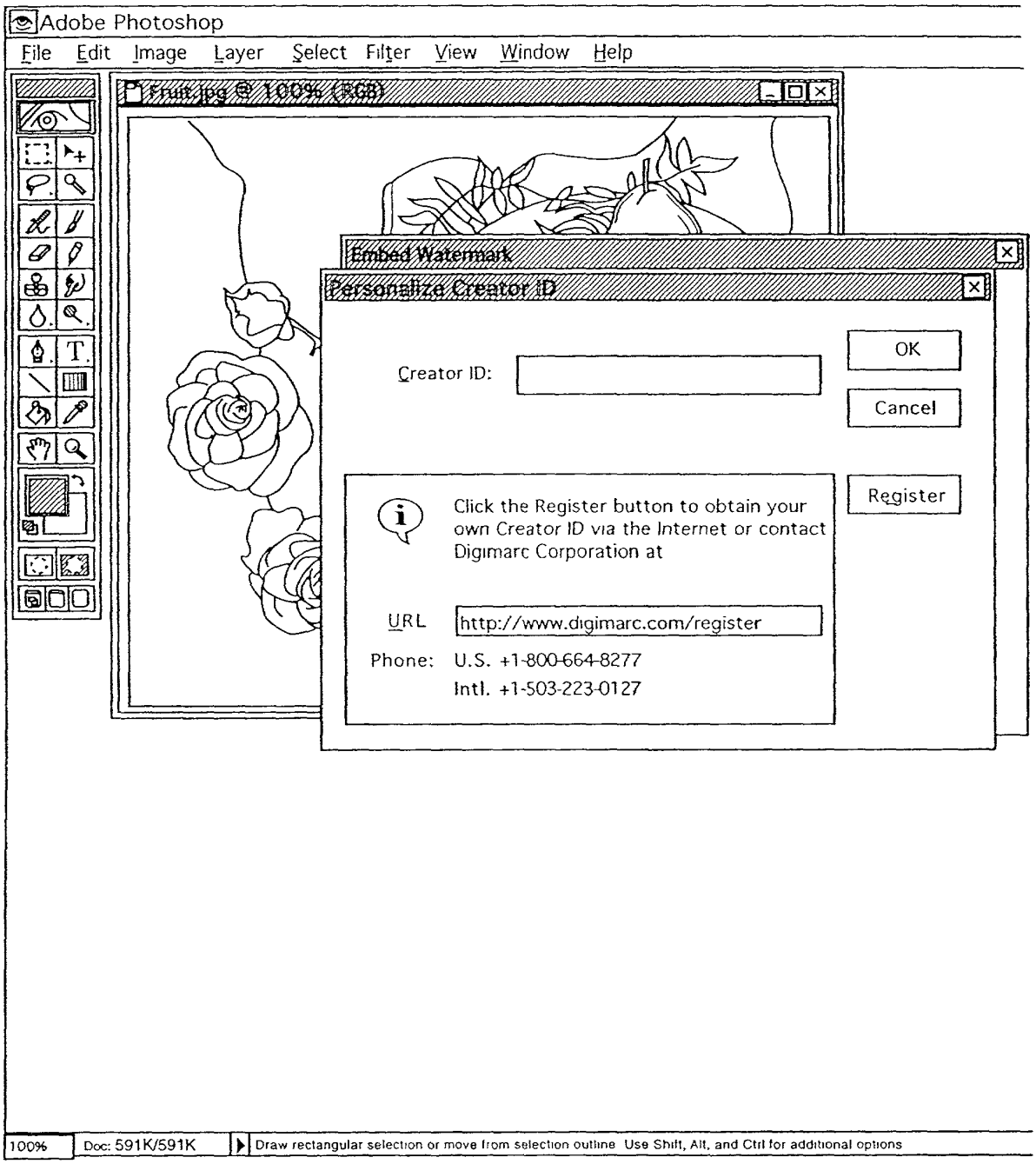
Embed Watermark
Copyright Info
Creator ID: PictureMarcDemo
Personalize...
Type of Use:
Restricted
Royalty Free
Adult Content
OK
Cancel
Watermark Durability
2
less visible
more visible
less durable
more durable
100%
Doc 591K/591K
Draw rectangular selection or move from selection outline. Use Shift, Alt, and Ctrl for additional options

FIG. 49


Adobe Photoshop
File Edit Image Layer Select Filter View Window Help
Fruit.jpg @ 100% (RGB)
Embed Watermark
Personalize Creator ID
Creator ID:
OK
Cancel
Register
Click the Register button to obtain your own Creator ID via the Internet or contact Digimarc Corporation at
URL
http://www.digimarc.com/register
Phone: U.S. +1-800-664-8277
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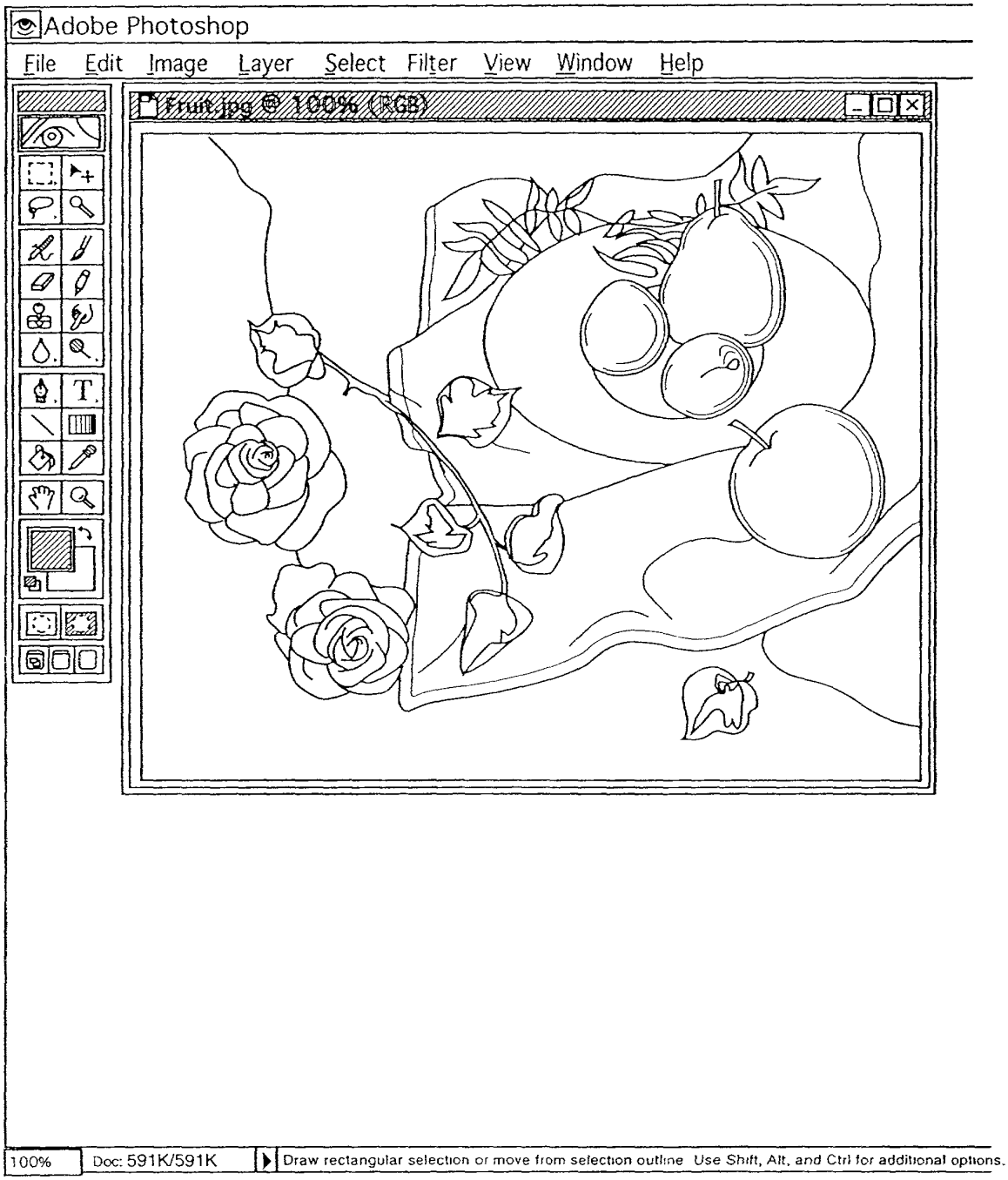
100%
Doc: 591K/591K
Draw rectangular selection or move from selection outline. Use Shift, Alt, and Ctrl for additional options

FIG. 50


Adobe Photoshop
File Edit Image Layer Select Filter View Window Help
Fruit.jpg @ 100% (RGB)
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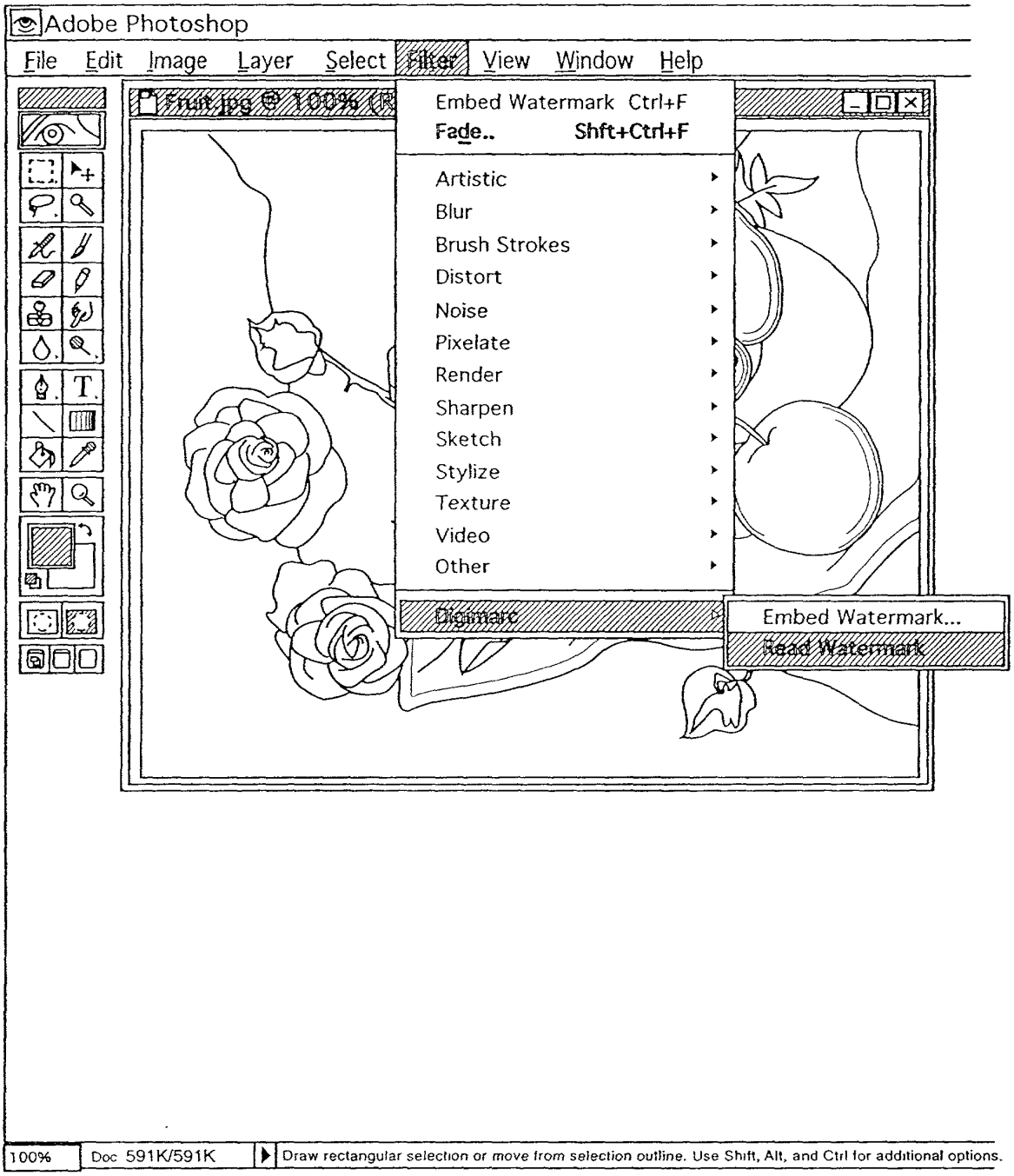
100%
Doc: 591K/591K
Draw rectangular selection or move from selection outline. Use Shift, Alt, and Ctrl for additional options.

FIG. 51


Adobe Photoshop
File Edit Image Layer Select Filter View Window Help
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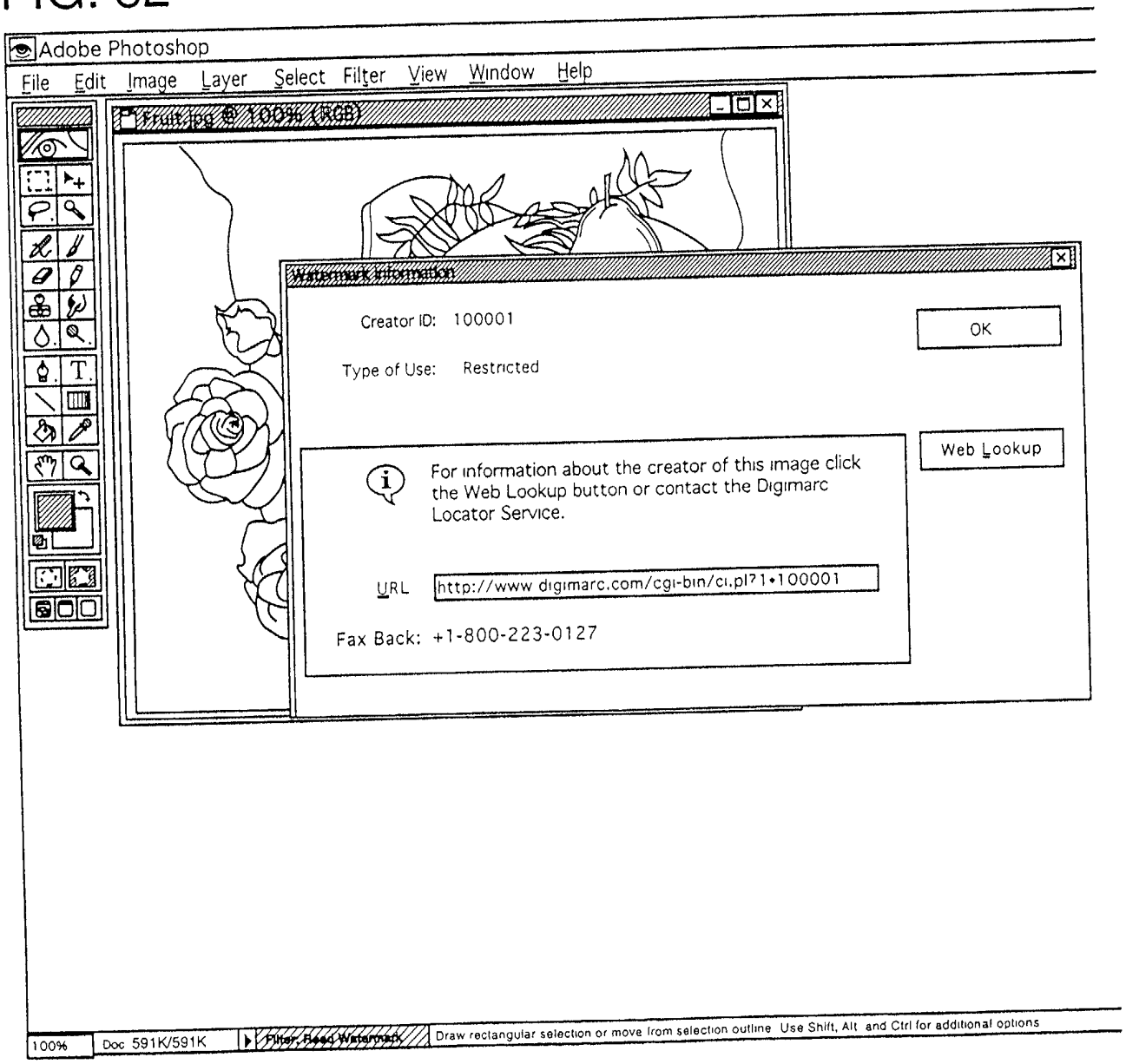
Fade.. Shft+Ctrl+F
Artistic
Blur
Brush Strokes
Distort
Noise
Pixelate
Render
Sharpen
Sketch
Stylize
Texture
Video
Other
Digimarc
Embed Watermark...
Read Watermark
100%
Doc 591K/591K
Draw rectangular selection or move from selection outline. Use Shift, Alt, and Ctrl for additional options.

FIG. 52


Adobe Photoshop
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Watermark Information
Creator ID: 100001
OK
Type of Use: Restricted
Web Lookup
For information about the creator of this image click the Web Lookup button or contact the Digimarc Locator Service.
URL http://www.digimarc.com/cgi-bin/ct.pl?1+100001
Fax Back: +1-800-223-0127
100%
Doc 591K/591K
Draw rectangular selection or move from selection outline. Use Shift, Alt and Ctrl for additional options

FIG. 53

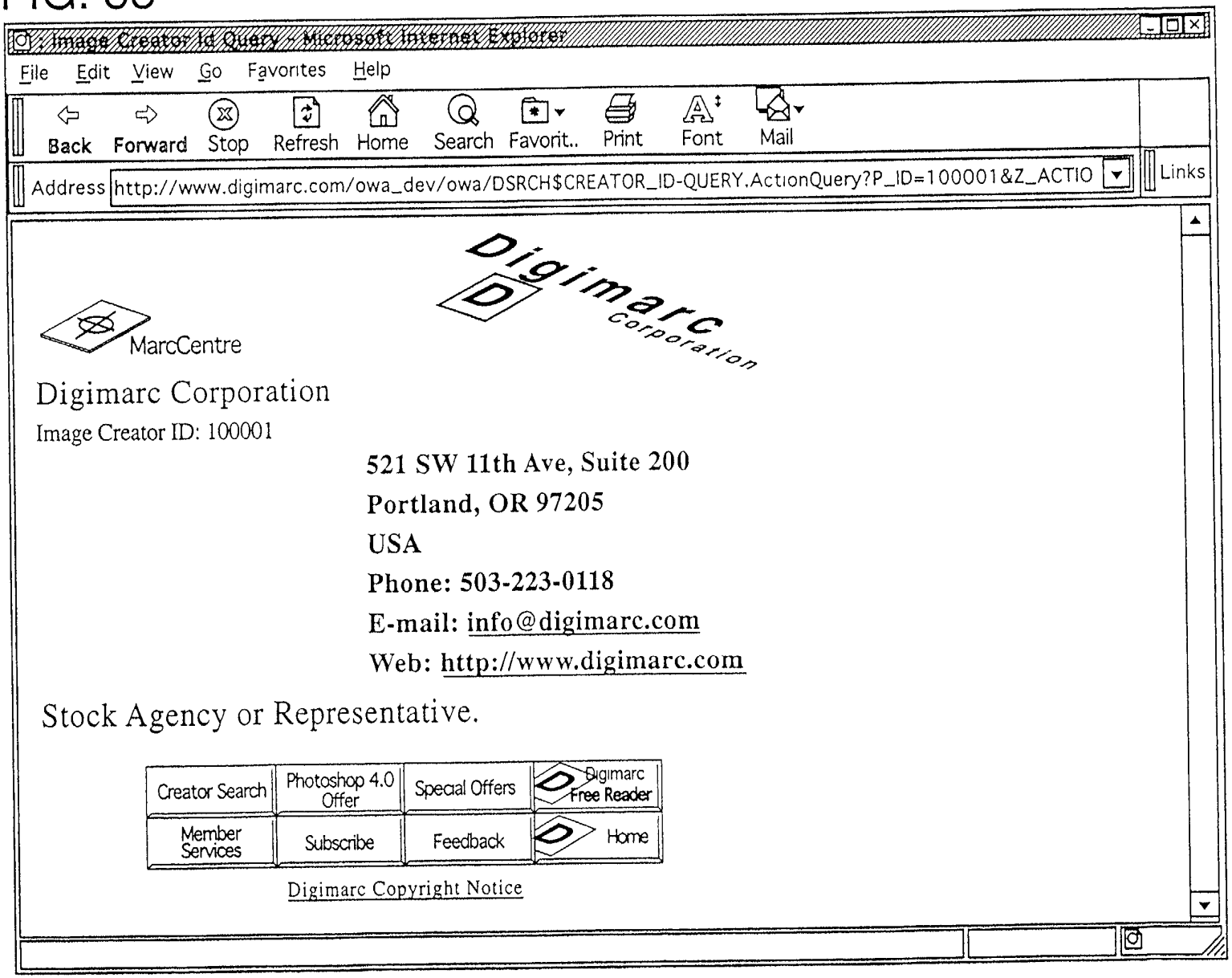
: Image Creator Id Query - Microsoft Internet Explorer
File Edit View Go Favorites Help
Back Forward Stop Refresh Home Search Favorit.. Print Font Mail
Address http://www.digimarc.com/owa_dev/owa/DSRCH$CREATOR_ID-QUERY.ActionQuery?P_ID=100001&Z_ACTIO
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FIG. 54

09342350 - 082598

FIG. 55

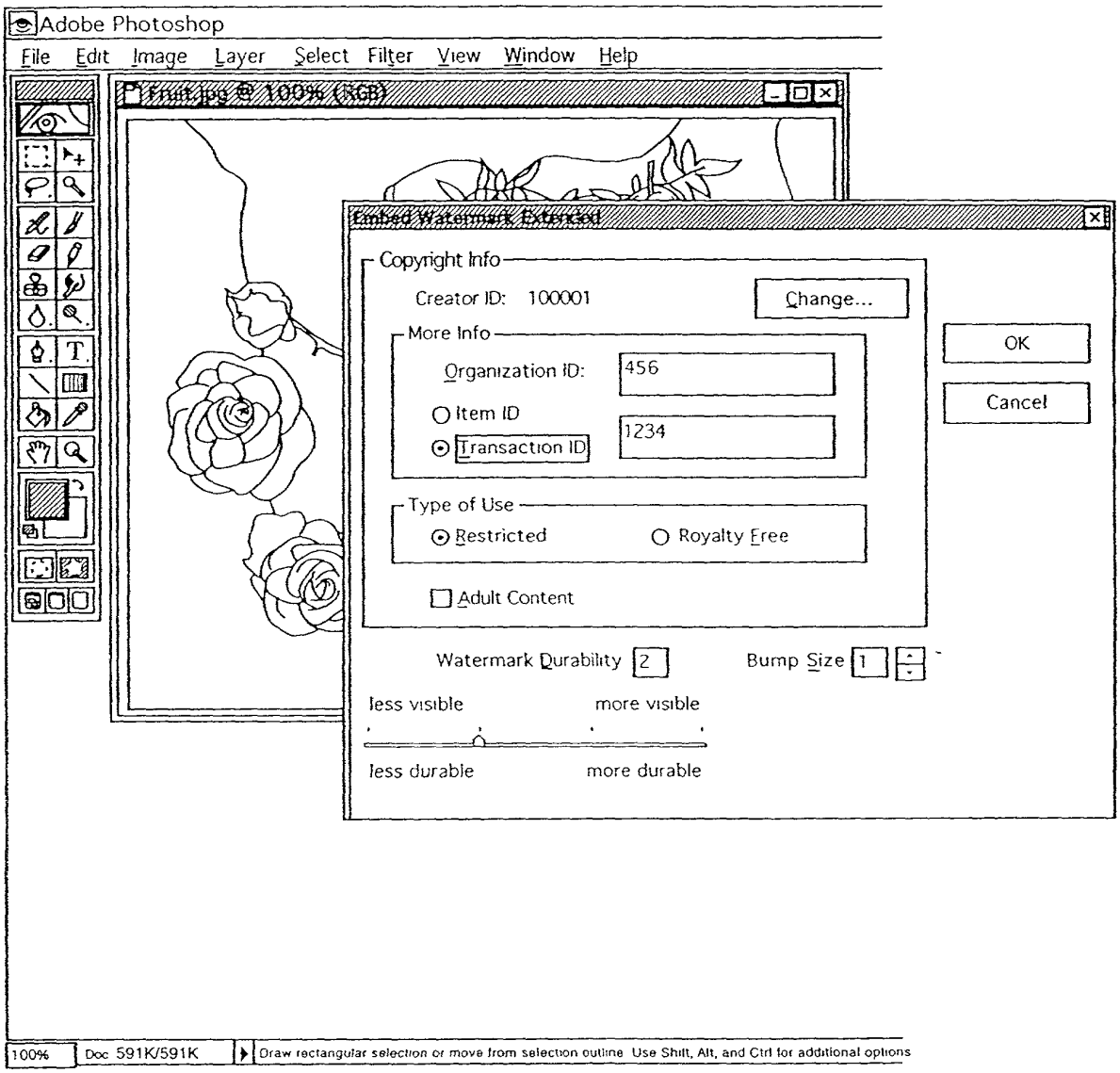
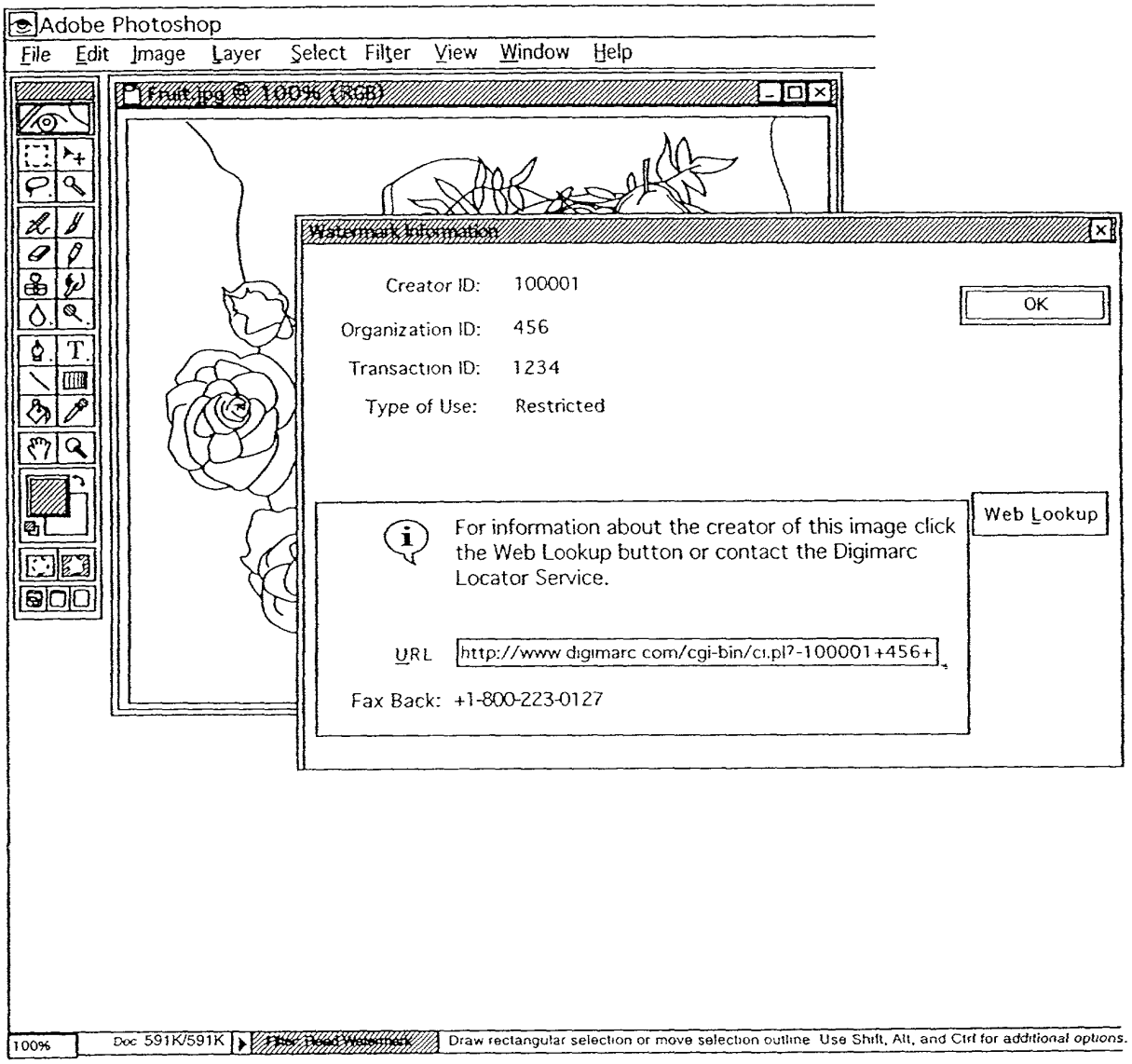

Adobe Photoshop
File Edit Image Layer Select Filter View Window Help
Fruit.jpg @ 100% (RGB)
Embed Watermark Extended
Copyright Info
Creator ID: 100001
Change...
More Info
Organization ID:
456
Item ID
Transaction ID
1234
OK
Cancel
Type of Use
Restricted
Royalty Free
Adult Content
Watermark Durability
2
Bump Size
1
less visible
more visible
less durable
more durable
100%
Doc: 591K/591K
Draw rectangular selection or move from selection outline. Use Shift, Alt, and Ctrl for additional options

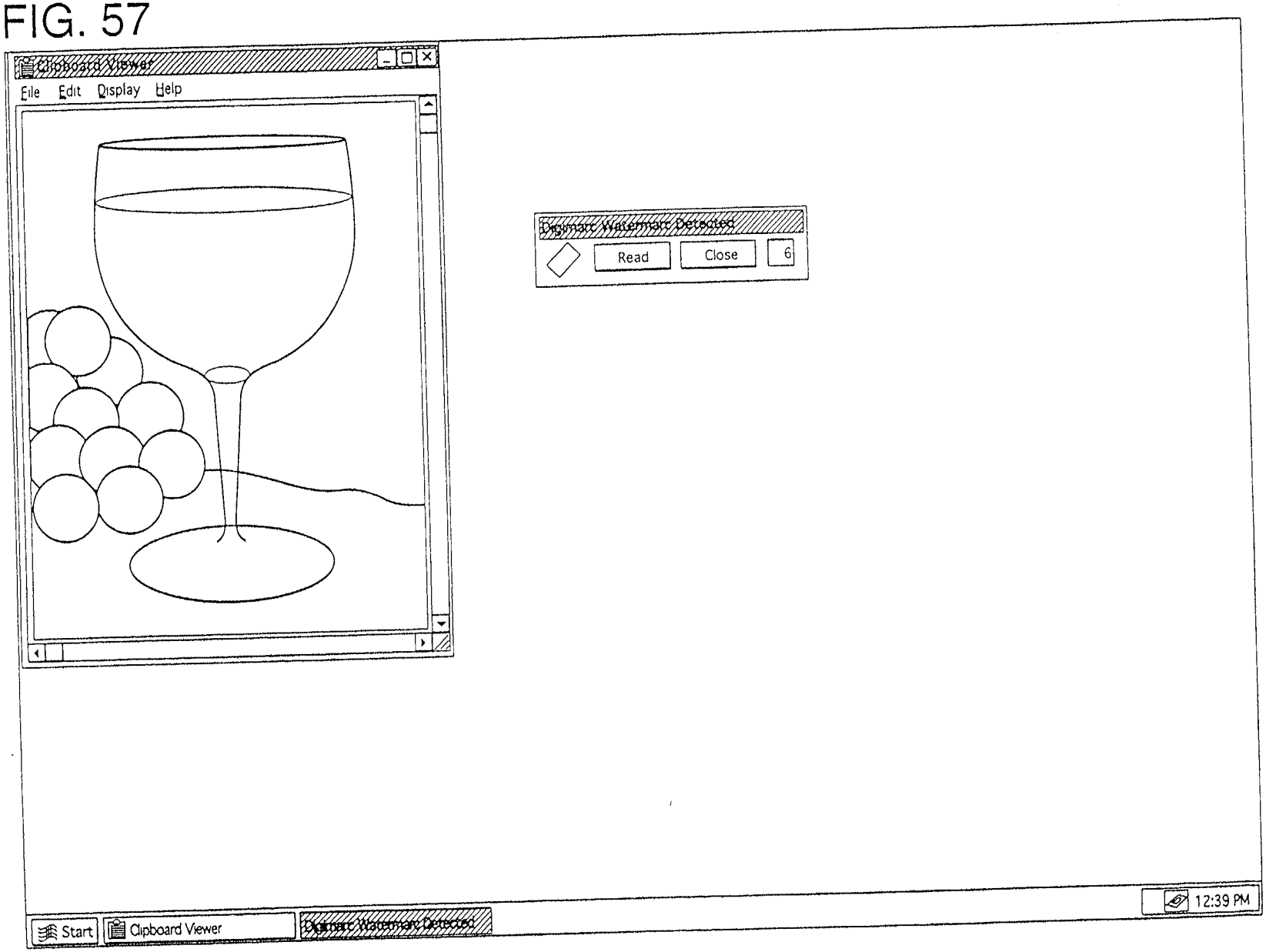
FIG. 56



5,636,292

Tosa20 Spec.sc9

FIG. 57



Toshiba Exhibit

FIG. 58

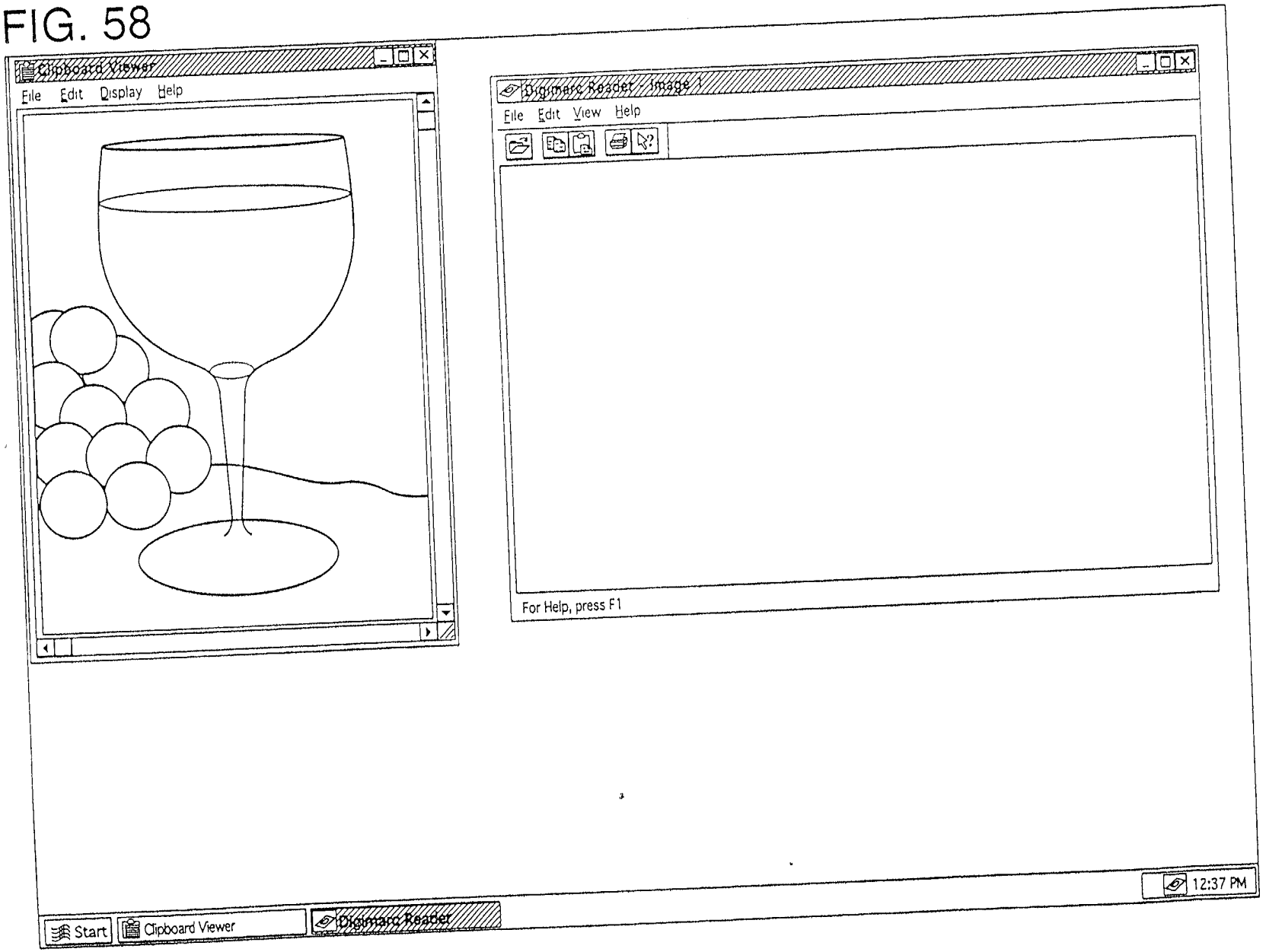
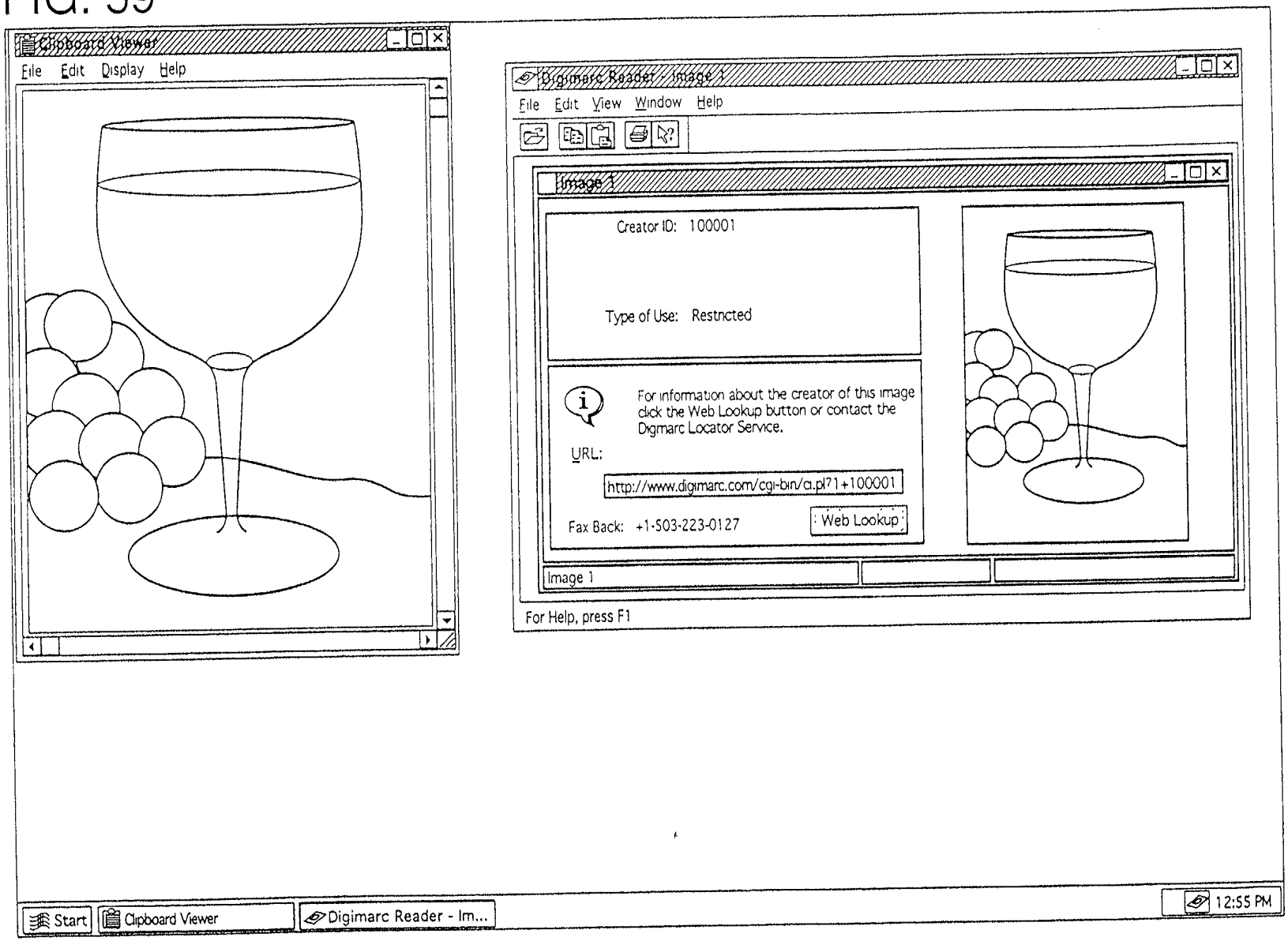


FIG. 59


Clipboard Viewer
File Edit Display Help
Digimarc Reader - Image 1
File Edit View Window Help
Image 1
Creator ID: 100001
Type of Use: Restricted
For information about the creator of this image click the Web Lookup button or contact the Digimarc Locator Service.
URL:
http://www.digimarc.com/cgi-bin/ct.pl?1+100001
Fax Back: +1-503-223-0127
Web Lookup
Image 1
For Help, press F1
Start
Clipboard Viewer
Digimarc Reader - Im...
12:55 PM